TV & Video • Hifi • Computers • What's New!

What's Ahead in our Electronic Future

NDD

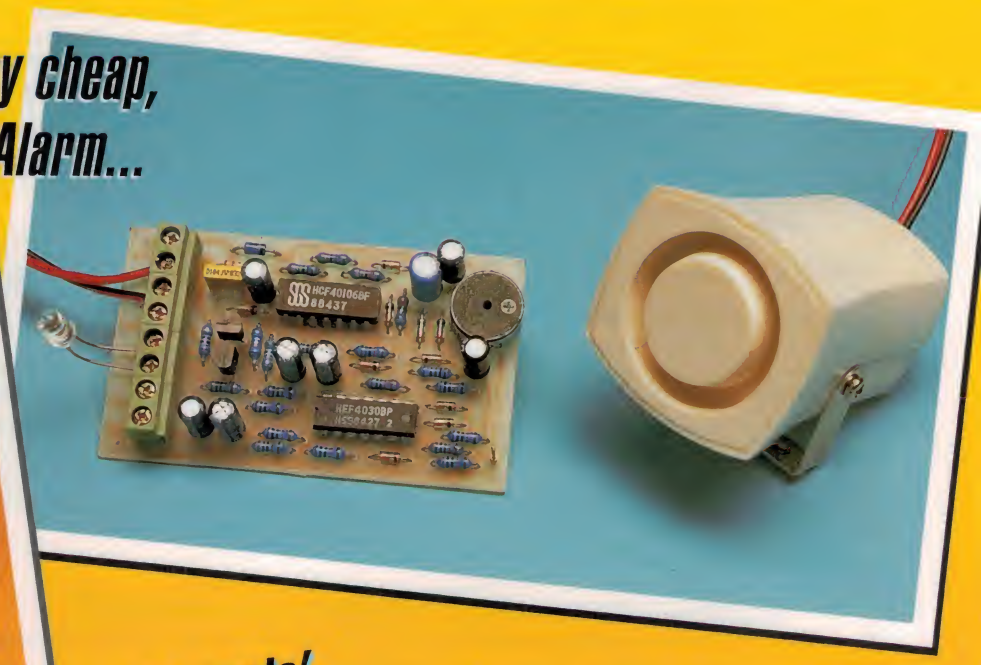
JANUARY 1999

Electronics Australia

with PROFESSIONAL ELECTRONICS & ETI

www.electronicsaustralia.com.au

Screecher Mk2: A very cheap, but VERY effective Car Alarm...



'No moving parts' low cost solid state Voice Recorder

WIN AN INCREDIBLE Hewlett-Packard Infinium 500MHz Scope worth over $20,800!

Switch-tuned Receiver for the VNG Radio Clock

$5.95
NZ $7.50 (inc GST)
FPC MAGAZINES
01
9 312966 123633

Print Post Approved PP255003/01056

Where do you GO for all new BASIC Stamp technology?

BASIC Stamps are small computers that run PBASIC programs, and communicate with other electronic devices. Their simple language and easy interfacing make BASIC Stamps ideal for many applications, for the hobbyist and for education.

The Stamp 1 and Stamp 2 are 14- and 24-pin modules, with the circuitry packed onto a small module. These modular BASIC Stamps have corresponding carrier boards for easy interfacing to PCs, power supply and prototyping. BASIC Stamps connect to your computer's parallel or serial port for programming. After being programmed they can be connected directly to buttons, LEDS and other TTL-level devices, and with extra components, to non-TTL devices such as relays.

BASIC Stamp 1 Revision E

- Runs PBASIC programs with 8 I/O lines
- 256 bytes EEPROM (program and data)
- 80 instructions maximum program length
- Parallel PC interface
- Insert into a carrier board (K 1402), connect with a cable and program using any IBM PC running DOS
- 9V DC power required
- 4 MHZ oscillator

K 1401 **$79** NEW

BASIC Stamp 2

- Features 16 I/O lines
- 2048 bytes EEPROM (program and data)
- 500 instructions maximum program length
- Insert into a carrier board (K 1403), connect with a cable and program using any IBM PC running DOS
- Serial PC interface
- 9V DC power required
- 20Mhz oscillator

K 1404 **$109** NEW

Available through mail order, PowerHouse and selected stores

BASIC Stamp Development kit

- Includes manuals for Stamps 1 and 2, cables for Stamps 1 and 2 programming and software to get you started
- Certificate for 3 months free technical support

K 1405 **$149** NEW

Available through mail order, PowerHouse and selected stores

BASIC Stamp 1 Carrier board K 1402 **$39**

BASIC Stamp 1 Revision D
Same features as Rev E, but is a complete PC board with prototype area and 9V DC battery clip. K 1400 **$79**

Parallel port interface for Stamp 1 K 1407 **$19.95**

Available through mail order, PowerHouse and selected stores

BASIC Stamp 2 Carrier board K 1403 **$49**

BASIC Stamp jumper connectors K 1406 **$9.95**

Programming and Customising the Basic Stamp Computer

A friendly introduction to building projects with BASIC stamps. With 10 complete projects and explanations. This book is a great start if you have no electronic or programming skills. CD ROM includes Stamp manuals and software and articles appearing in the Nuts & Volts magazine.

B 4807 **NEW** **$77.95**

EXCLUSIVE TO DICK SMITH ELECTRONICS

Vantis Mach 4 CPLD Starter Kit

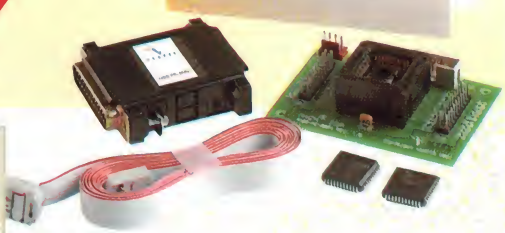
Bring your creative ideas to life from your personal computer using Vantis programmable logic.

This kit is designed as an entry-level introduction to programmable logic and desktop in-system programming. See the article in Electronics Australia Nov '98 for an example of the benefits of using complex programmable logic devices! Kit includes Synario Starter software Rev 2.0, MACHPRO software, cable, programming board, manual, two MACH4 devices and requires Win 95 or NT and 5V power supply.

K 1450

INTRODUCTORY LOW PRICE! **$99** **NEW**

Available in all stores



PHONE FAX & MAIL ORDERS

PHONE: 1300 366 644 (Local Call Charge) **FAX:** (02) 9395 1155
MAIL: **DICK SMITH ELECTRONICS,** Direct Link Reply Paid 160, PO Box 321, North Ryde NSW 1670 (No Stamp Required)

eftpos Not available at all authorised stockists.

direct link

Please add postage (up to 5kg) to your order, as follows:
• $4.00 ($1 Up To $50) • $7.50 ($51 Up To $100) • $9.00 ($101 Up To $500) • $11.00 (over $500)
(quote available for air/road freight or if over 5kg) email: directlink@dse.com.au (enquiries only)
•Major Credit Cards Accepted. • Gift Vouchers Available

For further information, orders or the location of your nearest store call:
1300 366 644 (Local Call Charge) Or Fax: (02) 9395 1155

DICK SMITH ELECTRONICS
That's where you go!

B 3618 INSIDE FRONT

Australia's largest selling electronics magazine — Established in 1922

Electronics Australia

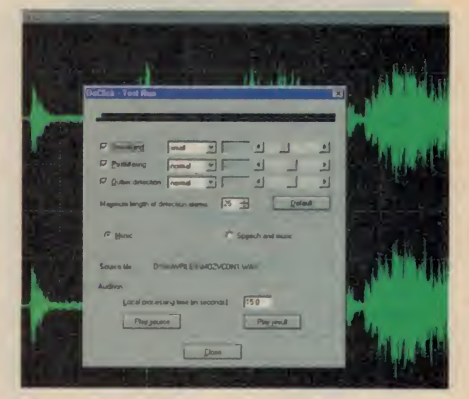
with PROFESSIONAL ELECTRONICS & ETI

January 1999 Volume 61, No. 1 www.electronicsaustralia.com.au

Successor for your VCR?

10 *What will you be time-shifting your digital TV shows on, in a year or two — this hard-disk based ReplayTV?*

Digital audio restoration



90 *Diamond Cut's DC-Art and Tracer's DART Pro 32 both let you clean up noisy old recordings, using your PC*

Australian 'cathedral' set

68 *Roger Johnson discusses the Raycophone 41E, a classic from 1931*

World of Electronics

Projects and Technical

Columns and Comments

Departments

On the cover

Rob Evans has updated and improved the very popular Screecher Car Alarm — see page 42. The other projects in this issue are the low cost solid state Voice Recorder (page 46) and Peter Stuart's five channel receiver to go with his VNG Radio Clock (page 56). (Photos by Phil Aynsley and Peter Stuart)

Professional Electronics

MANAGING EDITOR
Jamieson Rowe, B.A., B.Sc., SMIREE, VK2ZLO

TECHNICAL EDITOR
Rob Evans, CET (RMIT)

PROJECT DESIGNER/WRITER
Graham Cattley

PRODUCTION EDITOR
Witold Budzynski, B.Sc.

CONTRIBUTORS
Louis Challis
Roger Johnson, VK5ZKP
Jim Lawler, MTETIA
Jon Loughron, Assoc. Dip. Elect.
Tom Moffat, VK7TM
Peter Phillips, B.Ed., Dip Ed., ECC

READER SERVICES CO-ORDINATOR
Ana Marie Zamora; phone (02) 9353 0620
email: elt@hannan.com.au

DRAFTING
Jean-Baptiste Cattley

ADVERTISING MANAGER
Jon Lesjak; phone (02) 9353 0734

ADVERTISING PRODUCTION
Pamela Sceats; phone (02) 9353 0629

PRODUCTION MANAGER
Brett Baker

CIRCULATION MANAGER
Michael Prior

EDITORIAL DIRECTOR
Christine Whiston

GENERAL MANAGER
Geoff Baggett

HEAD OFFICE
PO Box 199, Alexandria 1435.
180 Bourke Road, Alexandria 2015.
Phone (02) 9353 0620; fax (02) 9353 0613
E-mail: electaus@magna.com.au
Web site: www.electronicsaustralia.com.au
Computer Bulletin Board: (02) 9353 0627
Subscriptions Enquiries:
phone (02) 9353 9992; fax (02) 9353 0967.

INTERSTATE ADVERTISING SALES
MELBOURNE: Kayren Browne
Level 8, 492 St Kilda Road, Melbourne 3004.
Phone (03) 9864 1222; fax (03) 9864 1211.
BRISBANE: Graham Smith
26 Chermside Street, Newstead 4006.
Phone (07) 3854 1119; fax (07) 3252 3692.
ADELAIDE: Sue Bowshall
98 Jervois Street, Torrensville, 5031.
Phone (08) 8352 7937; fax (08) 8352 6033.
PERTH: JWP Media Specialists
362 Canning Highway, Como 6152.
Phone (08) 9368 2973; fax (08) 9368 6900.

ELECTRONICS AUSTRALIA is published by FPC Magazines, a division of Eastern Suburbs Newspapers Partnership, which is owned by General Newspapers Pty Ltd.
A.C.N.000 117 322,
Double Bay Newspapers Pty Ltd.
A.C.N.000 237 598, and
Brehmer Fairfax Pty Ltd.
A.C.N.008 629 767,
180 Bourke Road, Alexandria, NSW 2015.

Printed by Macquarie Print, 51 - 59 Wheelers Lane, Dubbo 2830. Phone (02) 68 843 444.
Distributed by Newsagents Direct Distribution Pty Ltd, 150 Bourke Rd, Alexandria 2015; phone (02) 9353 9911.
ISSN 1328-6218

* Recommended & maximum Australian retail price.

Member of the Audit Bureau of Circulations

Letters to the Editor

USB and IRQs

In *EA* Oct '98 you were discussing lack of IRQs and ways around the problem. As a computer consultant I come across these problems regularly.

One point made was USB devices. There are a number of devices relying on USB connections now, eg latest releases of miniature video cameras for Internet communications and new models of digital cameras. Upcoming releases include Zip drives, floppy drives and standard peripherals like the humble mouse and modem. As mentioned this should free up some IRQs used by serial ports. You made the mistake of saying that this won't happen and we are stuck with them. This is wrong, and I say this from personal experience. New Dell and other brand name computers are coming with only one serial port on the back, this being for the modem. The mouse is PS/2. In my own PC using a standard Pentium motherboard I use only one serial port, again the modem, and disable the other port in the BIOS, freeing IRQ 3 up.

As for sharing IRQs, this used to be a tricky thing to do. Current Plug 'n Play PCI cards actually support IRQ sharing, so that the video card and the 3D effects card could share the same IRQ. This is only possible, though, with fairly up to date BIOSes and cards that support it.

Hopefully these problems will become less in the future, with PCI sound cards and Windows DirectX games. The only problem is backwards compatability with older DOS games, which sometimes only support low IRQs (3-7) for sound cards.

Conrad Smith, CSET Technologies (by e-mail)

DVD players, regions

In am writing in relation to the letter on page 4 of the September issue, titled 'DVD players'. I can fully understand the frustration of not being able to get or play the program of whatever you choose on the DVD playing system, due to zoning. My opinion is exactly as his, and will not purchase any unit that cannot play all nations' programs. I call this method of protection not copy protection, but censorship of the worst kind.

It is so because I am one of those immigrants that as well as enjoying local products, I listen to foreign music and films. That is I came from Germany and enjoy seeing and hearing products from the European continent. Australia is supposed to be multicultural, as am I.

So until Australian authorities force Australian products to be multicultural without restrictions, then those products have only one place: on the manufacturer's shelf.

Dieter Kuenne, Bayswater Vic

Variable frequency drive

I was interested to read (when I got the chance recently) Phil Allison's article '240V Variable Frequency Drive', in EA July 1998, since it bears more than a passing resemblance to my own 'Frequency Control of Turntable Motors' (*Wireless World* July 1983, pp70-71).

My design used a 566 voltage-controlled oscillator with a sine-wave shaping network, since this provided stable control with a single potentiometer. The power amplifier was a 20W Sanken hybrid audio module which had become available from an older power amplifier. A more recent elaboration is output voltage feedback to stabilise the voltage independently of load and frequency.

Several points made by Phil Allison deserve comment in the light of my own experience:

1. I used a simple common E-core power transformer for the output. I did not experience any problems with excessive magnetising current. My use (probably accidental) of one with a 24-30V secondary may well have avoided the problems Phil found with a 9V secondary.
2. The power amplifier was capacitor-coupled, so that problems with DC through the transformer were avoided.
3. My experience in this country (New Zealand), is that the control of mains frequencies is far from precise. The overall daily control will keep synchronous clocks accurate, but significant variations will occur in the shorter term. The tendency is that heavy consumption causes the grid frequency to drop, requiring a period of faster running, usually near midnight. It was the clearly-audible consequences of this which led me to develop my circuit in the first place. My suspicions were subsequently confirmed when I was given the frequency control specifications from

the NZ Electricity Department operators' handbook which suggested that load shedding was not required until the frequency had dropped to below 45Hz.
4. The 110/240V adjustment of my Thorens TD160C turntable comprised a 10k series power resistor, and the load seen by the supply appeared largely to be resistive. I had never contemplated any power factor correction.
5. One of the significant benefits of a mains-independent supply is the increased isolation it gives between the mains and the front end of the preamp, making the phono input even more robust against mains-borne noises.

Thanks for an interesting magazine.

Dr Peter A. Stockwell, Dunedin NZ

Scope safety warning

I recently had a 'flashover' problem in an oscilloscope. Removal of the cover, then running the unit in dim light quickly traced the problem to the 'Intensity' control pot. It was close enough to the chassis for a spark to jump (control setting dependant).

The disturbing feature of this situation is that it and the Focus pot are both insulated from the chassis, and their control spindles exit onto the front panel as operator adjustments. Removal of the knobs can expose the operator to some quite nasty voltages and the knobs are not skirted. This could also pose a risk.

While we would appreciate that making the internals of high voltage equipment intrinsically safe (while running) is difficult and often impossible, there is no excuse for the unit to be dangerous to the operator when all of the covers etc. are in place. It may be pertinent to remind the importers of such equipment that they may have liability under OH&S Workcover legislation, or common law, if someone is injured by poorly designed equipment such as this.

The oscilloscope carried the Goodwill brand.

Marc Chick (by e-mail) ❖

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.

Editorial Viewpoint

How far we've come since it all began, and what might be coming...

As this is our first issue of what's undeniably the final year of the 1900s, we've prepared a special feature article to mark the occasion. It starts on page 10, and what we've tried to do is put in perspective the electronics developments that *we* believe have been most significant in the last few years — plus a few thoughts on what we think might be coming along soon.

This kind of crystal-ball gazing is fraught with risks, of course. Especially in a field like electronics, where developments can be quite unexpected and surprisingly fast in making the transition from lab to marketplace. To try and achieve a better hit rate, and also to make the article more interesting for you to read, we decided to pool our resources. Instead of his usual review Louis Challis has joined Rob Evans, Graham Cattley and myself, and all four of us have offered our thoughts about the various areas in electronics that we feel are most exciting or noteworthy. We hope you'll find the feature worthwhile — and not *too* out of date by the time you read it. (Only this morning, for example, IBM announced its new 25 gigabyte hard disk drive for PCs, pictured on page 77...)

Also in this issue (page 30) you'll find the first episode of a new column by our old friend and contributor Stewart Fist. As many of you may know, Stewart is very knowledgeable about communications technology, and has also looked at considerable depth into the ongoing debate about the possible health risks associated with EMFs from powerlines, cell phones and other technology. At the same time he always strives to be as objective as possible, and won't hesitate to criticise nonsense regardless of its origin. I feel sure you'll find his new column worthwhile and thought-provoking, especially as he has been given a free rein to explore and comment on any aspect of electronics.

With the holiday season in mind, we also have some interesting construction projects for you. There's the Screecher Mk2, for example, Rob Evans' updated and improved version of a very popular 1986 design for a very cheap, but amazingly effective car security alarm (see page 42). That piezo siren may look unassuming — but just try to stay inside the car when it's operating!

Then there's a low cost solid state Voice Recorder, developed by Oatley Electronics (page 46). Based on a high quality analog sampling chip to simplify construction, it can store over 20 seconds of speech and the good news is that a kit is available for less than $20 (including speaker).

We also have the first instalment of two articles from Peter Stuart, describing a low cost five-channel receiver to go with his VNG Clock design. Not to mention a simple Quiz Timer, in Owen Bishop's $10 Wonders series, and some very simple experimental testing circuits in Darren Yates' Experimenting with Electronics column.

If you're interested in using your PC for digital audio recording, you might also find some of this month's reviews of interest. Rob Evans reviews the Terratec Base1 sound card on page 93, while I report on the DART Pro 32 and DC-Art digital audio restoration packages, starting on page 90.

One way and another, then, we trust you'll find plenty of things in this issue to keep you occupied during the holiday season. Relax and enjoy!

Jim Rowe

WHAT'S new
in the ever-changing world of electronics

Economy backup tape drive for PCs

The Computer Systems Division of Aiwa has shaken the US backup tape drive market by releasing a new 10GB-capacity standalone drive, the External Aiwa Bolt, which sells for only US$179 — about half the price of existing drives. Matching 10GB (ATP-110) and 6.6GB (ATP-106) tape cartridges are available for only US$35.99 and $29.99 respectively. The unit can also read Travan TR-3 cartridges.

Data transfer to the External Aiwa Bolt is at 50MB/min, requiring about 20 minutes to back up 1GB of data. The drive is bundled with Backup Exec software for Windows 95/98 and Windows Workstation NT4.

Aiwa America expects the External Bolt to become popular with PC and laptop users, allowing them to backup their files on a single, low cost tape cartridge. For more information see the company's web site at **www.aiwa.com/csd**.

New high-end amps from Madrigal Audio

US maker Madrigal Audio Laboratories, Inc. has announced three new Mark Levinson amplifier models: the 334, 335 and 336, which replace the award-winning 331/332/333 amplifiers.

New features include greater output power, new output stage devices, lower THD and IMD, improved communications circuitry and the introduction of special cyanate ester PC boards in the critical voltage gain stages. Cyanate ester PC boards represent the single most costly addition to the new amplifiers. They're claimed to exhibit an unusually low dielectric constant and offer the critical voltage gain circuitry a more ideal electrical enviromnent.

Prices and power ratings are as follows:

Model 334: US$5900, 125W at 8Ω, 250W at 4Ω, 500W at 2Ω.

Model 335: US$7900, 250W at 8Ω 500W at 4Ω, 1000W at 2Ω.

Model 336: US$9500, 350W at 8Ω, 700W at 4Ω, 1400W at 2Ω.

All power ratings are achieved with both channels driven, from 20 to 20kHz at rated noise and distortion.

For more information visit Madrigal at **www.madrigal.com** or contact Madrigal Audio Labs, 2081 South Main Street, Middletown CT 06457.07081.

Multifunction SOHO device from Canon

Canon has launched the Canon MultiPASS C50, a compact desktop device delivering colour printing, scanning and copying as well as functioning as a plain paper fax and PC fax. The MultiPASS C50 is an all-in-one colour solution to minimise the use of desk space and provide the versatility and functionality required for professional use in the office or home.

Canon says the MultiPASS C50 delivers outstanding photographic reproduction with its PhotoRealism printing technology, which uses low-density inks applied to a single dot many times to give increased colour combinations. The unit prints text or graphics direct from a PC at a resolution of 720 x 360dpi, achieving laser-like speeds with monochrome printing up to 5ppm and colour printing speeds up to 2ppm. It also offers increased versatility with its ability to operate as a stand-alone colour copier. Up to 99 copies can be printed in crisp black and white, and single pages in full colour, with the ability to reduce copies to 70%, 80% and 90%.

The C50 also includes a 24-bit colour scanner for reproducing rich detailed photos, illustrations and text. With an optical resolution of 300dpi and an enhanced resolution of 600dpi, up to 20 A4 pages can be scanned by simply placing the document in the automatic feeder.

Canon also provides easy-to-use software which includes a TWAIN driver and Corel Print House Magic Software.

As a stand-alone fax machine the C50 is capable of transmission speeds of six pages per second with memory to store up to 42 pages of incoming or outgoing faxes.

The Canon MultiPASS C50 is available from Canon dealers and selected retail stores at an RRP of $999. For more information circle **145** on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.

Improved handheld PC

Sporting what is claimed as the fastest CPU on the market, the new Philips Velo 500 is set to raise performance standards among Windows CE-based handheld PCs. It maintains the same small form factor as the award-winning Velo 1, but with a host of new features, including the fastest 75MHz 32-bit MIPS processor (manufactured by Philips Semiconductors) on the market.

Velo 500 incorporates a 640 x 240 pixel touch screen with 16 levels of grayscale, fax send and receive capabilities and 16MB of memory. The weight is only 425g including batteries. Enhancements include an optional 28.8kb/s modem for fast access to e-mail and the web, and other features such as on-demand backlighting, user-configurable shortcut buttons and updated versions of the voice recorder and database.

Velo 500 comes with Windows CE2.0 incorporating pocket versions of Microsoft Word, Excel, Outlook, Powerpoint and Internet Explorer. It also comes with a docking station for seamless synchronization between Velo and Windows 95 equipped PCs, an AC adaptor and NIMH rechargeable battery pack.

RRP for the Velo 500 is $1429. For more information circle **147** on the reader service card or contact Philips Electronics on 1800 144 733.

Aust hifi speaker system re-engineered

South Australian loudspeaker designer and manufacturer Sonique Audio has re-engineered its award winning SAV-4 loudspeaker system for hifi and home theatre systems. The company says the new improved SAV-4MK2 includes many features that would normally be reserved for far more expensive loudspeakers.

A new cabinet design and construction improves both performance and appearance.

The cabinets feature 25mm thick walls with natural timber baffles, and use shielded drivers to ensure that the customer has maximum flexibility for placement — close to the TV if required. An all-new crossover also provides even lower distortion, a more linear bass response with added weight, and more refined mid-range.

Despite the improvements the RRP of the improved SAV-4MK2 system is only $1295/pair, the same as the previous model.

For more information circle **140** on the reader service card or contact Sonique Audio, PO Box 201, Salisbury South, SA 5106.

Six head stereo VCR

Philips' new six-head top of the range VR988 hifi stereo VCR has a classy silver metallic finish and is claimed as a true 'world' VCR, with multisystem recording and playback of NTSC, PAL and MESECAM video cassettes. It also operates from multi voltage and includes a Hyperband CATV tuner, allowing reception of all Superband and Hyperband channels.

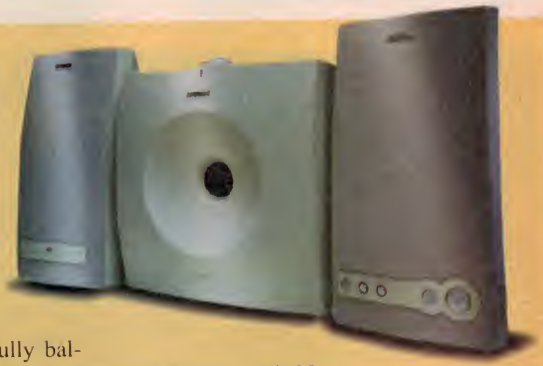
Newly added audio dubbing enables editing of the sound separately, from CDs or voice, to add sound to video recordings. The four video head system ensures high quality stills, interference free slow motion and frame-by-frame advance, while an extra two audio heads are added to provide high quality stereo hifi sound.

The VR988's jog and shuttle remote control can be illuminated by a red LED, making it very suitable for viewing in a darkened room. The remote will control most TV brands for on/off, volume and channel changes. It also includes G-Code for easy timed recording.

The VR988 has an RRP of $879. For more information circle **143** on the reader service card or call Philips Sound and Vision on 131 993.

WHAT'S new in the ever-changing world of electronics

PC multimedia audio system uses USB



Philips says that all you need do is plug in its new DSS370 combination of digital speakers and subwoofer, to experience unequalled multimedia sound performance from your Windows 98 PC. Taking full advantage of Universal Serial Bus (USB) and Philips audio technologies, the versatile DSS370 offers plug and play convenience and no-hassle installation combined with excellent audio reproduction.

Full control of the DSS370 is achieved from the PC, via an easy-to-use bidirectional GUI. The system also 'plays' digital audio directly, obviating the need for a conventional sound card. By converting digital audio to analog audio right at the speaker, the DSS370 is claimed to achieve signal-to-noise ratios of 98dB and sampling rates up to 55kHz. Combined with Philips patented SelfOscillating Class D amplifier, the resulting sound quality is claimed to exceed that of standard audio CD players.

The DSS370's two digital speakers and single 30-watt subwoofer make for a powerful three-piece audio system. The active subwoofer improves the low frequency performance of the satellite speakers, creating a fully balanced and richer sound. A patented 'Incredible Surround' feature creates a full, realistic 3D sound that appears to come from all corners, while Dynamic Bass Boost (DBB) produces additional bass when needed most — during low speaker volumes and music requiring extra bass.

The DSS370 takes full advantage of digital audio-streaming under Win98, while remaining fully compatible with Win95 and Win3.1. Win98 PCs provide full USB digital audio and on-screen GUI. By installing drivers, Win95 PCs with USB can take advantage of the DSS370's superior sound and on-screen GUI. Analog playback is available on Win3.1 PCs.

For more information circle **141** on the reader service card or contact Philips Electronics' consumer hotline on 131 993.

42" flat screen TV has widescreen format

Philips claims that TV viewing in Australia is set to be redefined with the launch of its new 42PW9982 Flat TV, a high-end flat panel television with a display that can be hung on a wall just like a painting. Unlike other large-screen sets using conventional direct view and projection technologies, Flat TV has a plasma screen which is only 110mm deep, making it ideal for wall mounting.

Recently launched in the United States and Europe, the Philips Flat TV has already been named in the European Imaging & Sound Association awards as European Flat TV System of the Year 1998/99, described by judges as the set which 'defines the future of television'. With its large screen size in widescreen 16:9 format and greatly reduced depth and weight compared with conventional CRT-based large screen sets, Flat TV is very suitable for home cinema use.

Using new flat panel technology, Philips has been able to develop a much larger screen size (106cm) than is possible with traditional picture tubes. The result is an undistorted, perfectly flat screen with an incredibly realistic image and wide 160° viewing angle. Flat TV has multi-standard reception and is able to receive PAL, SECAM and NTSC signals. It also has a VGA connector, making it suitable for multimedia PC presentations. It also has a built-in Dolby Pro Logic Surround system, integrated into the frame that surrounds the screen. An additional subwoofer can be placed in any convenient location. Two separate two-way surround speakers are provided, giving a total of 15 speakers and 120 watts (RMS) of sound.

RRP for the Flat TV 42PW9982 is $29,999. For more information, circle **146** on the reader service card or contact Philips Electronics on 131 993.

Premium output 'bottles'

New York based valve or 'vacuum tube' supplier New Sensor Corporation says the new Sovtek 6550WD and 6550WE were designed to be the finest 6550-type output valves ever produced. Thicker plates, improved heat dissipation, higher transconductance and increased linearity are just some of the inherent aspects of the new Sovtek super 6550s.

The resulting performance advantages are claimed to include 5% higher output power, increased reliability, greater headroom, and superior tone. According to Sovtek this makes the 6550WD and 6550WE the premier 6550s available, for valve based audiophile amplifiers.

For more information visit the firm's website at **www.sovtek.com**, or contact New Sensor Corporation at 20 Cooper Square, New York NY 10003.

"Simply...the best performance and value for money available!"

"One could be forgiven for thinking that these speakers were 10 times the price...The stereo imaging was truly outstanding...The VAF Signature I-51 system has one of the finest high frequency responses of any
Electronics Australia

"Are these the best kit speakers in the world?...On the evidence, we'd have to say that VAF's I-66 design would be odds on favourite to take out the award."
Best Buys Speakers, Amplifiers, Receivers

"... don't think there's any other way you could obtain this high level of sound quality at such a low price..."
Australian Hi-Fi

"A new benchmark in excellence in every criteria: construction, design, finish, innovation."
Best Buys Home Theatre 97' 98'

"Highly and unreservedly recommended."
Best Buys Home Theatre

"... In value for money stakes or even sound for dollar stakes for that matter, they're nigh on impossible to beat."
Australian Hi-Fi

"We love the DC-Xs. These are true high fidelity speakers, and deserve a pedigree second to none. we are confident that that will be the case in time. Their performance is a revelation. The combination of the DC-Xs, the DC-6 and DC-2s is a happy, fully compatible, articulate and balanced system that beats anything we can think of in its price range. Actually,probably close to twice its price range."
Best Buys Home Theatre 98' 99'

"The VAF DC-Series home theatre system exhibits a new benchmark of excellence in every criteria: construction, design finish , innovation...it seems almost churlish to mention the astounding value that each of these components represents."
Best Buys Home Theatre

Signature
SURROUND PACKAGE

"All areas of the DC-X's performance could easily be attributed to models costing a great deal more...The very design of the DC-x sets a few new standards in speaker engineering, some of which help it achieve incredible levels of versatility across amplifiers and source products and Home Theatre applications...Amazing value!"
Audio Video Lifestyle Magazine

"Unmatched performance at the price.The new DC-2 significantly raises the standard by which speakers at its price will be measured. This speaker is destined to become a classic."

INNOVATION 20 Years DEVELOPMENT

VAF RESEARCH

hear IT
see IT
feel IT
REALITY

Speakers For Audiophile Purists or Home Theatre Extremists
12 Models Either Fully Assembled or As Ready To Assemble Kits.

For information further contact us on:
FREECALL 1800 818 882
www.VAF.com.au.

DC series
Signature series
Home Theatre solutions

VAF Research Pty Ltd. 291 Churchill Road Prospect South Australia 5082 Phone: (08) 82694446 Fax: (08) 82694460 Internet: www.VAF.com.au e-mail: vaf@vaf.com.au

READER INFO NO 2

Today's Electronics, and What may be Ahead

The beginning of this final year of the 1900s seems a good time to take stock of how far electronics has come, to date, and also discuss the developments that seem likely to occur in the next year or two. Here are the collective thoughts, predictions and 'If only' comments of *EA*'s Louis Challis, Rob Evans, Graham Cattley and Jim Rowe.

WHILE THERE'S ongoing debate about the exact start of the new millennium, there can be no argument that 1999 is the last year we'll see with '19' as its first two digits (except on computers that aren't Y2K compliant!). So this month has a vague 'beginning of the end of an era' feeling about it.

It seems a good time, then, to pause and reflect on the current state of play in our fast-evolving electronics industry. To think a bit about how far it's come, and also try to look into the crystal ball and offer a few predictions about what seems likely to come along in the near future, by way of new products and technologies. Plus, perhaps, a few thoughts about what we'd *like* to see happen...

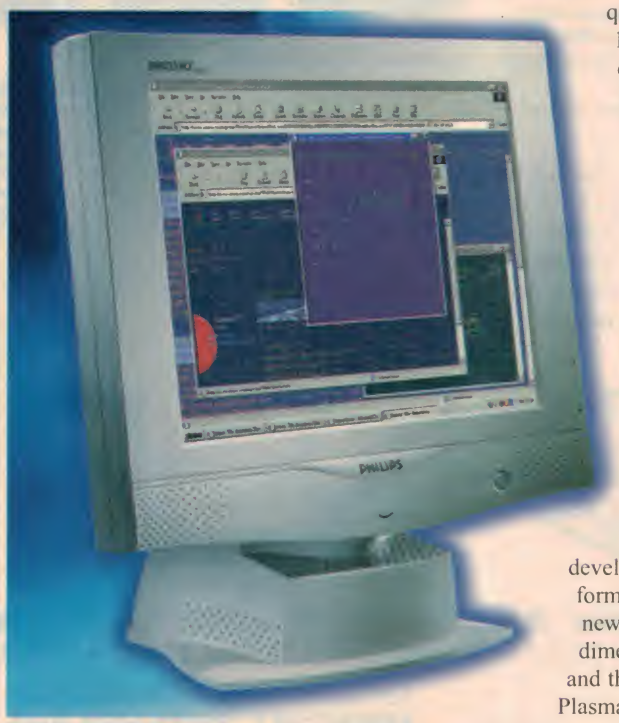
Of course crystal ball gazing is always a risky business. Most of the time even industry gurus find it hard to achieve more than a 50% success rate. But hopefully it's still worth a try, even if in the future our predictions turn out to be little more than a record of what we were expecting as the millenium drew to a close.

In an effort to reduce the margin of error, and also to provide more interest and a broader perspective than would be achieved from a single author, we've decided to pool our editorial resources to produce a joint effort. So in many of the following areas of discussion, you'll find comments from our video and audio reviewer Louis Challis (LC), technical editor Rob Evans (RE), technical writer Graham Cattley (GC) and editor Jim Rowe (JR).

Sometimes our comments regarding particular products and technologies will seem very similar, while in others they'll tend to differ quite a bit. At the very least that should indicate where opinions differ in the broader industry, and perhaps help you to clarify your own perspective.

We're not claiming infallibility in terms of either hindsight or foresight, of course. But at least you should find what follows interesting and thought provoking.

OK then, let's get going with some thoughts about:



Philips' 151AX is a good example of the new generation of LCD monitors, delivering excellent image performance at a significantly lower price.

Display technology

LC: A close look at last year's reviews must lead you, as it has me, to the view that even the video component of our home music, TV or home theatre systems is heading for dramatic changes and unquestioned improvements. Indeed, the exciting and new forms of video technology which were marketed or quietly displayed to us during 1998 must ultimately spell the doom of conventional cathode ray tube video and computer display technology.

The most important and exciting items of video equipment which we reviewed were, firstly, Sony's development of its Wega flat-faced TVs. Second and by no means less important were Apple's and Philips' release of medium-sized LCD displays for either TV or conventional computer applications. Thirdly, and by no means lastly, Pioneer's and NEC's developments of their wide screen format plasma displays, offering a new dimension (or should I say dimensions) in home TV, video and theatre.

Plasma displays, supplemented by the intelligent use of line-doubler hardware, will soon provide many households with the type of displays which we have seen in science fiction films. Those displays are already capable of providing us with superb

Digital high-definition TV is now being broadcast in the USA, and manufacturers like Thomson Consumer Electronics are selling widescreen projection receivers like this, to those who can afford them. Digital HDTV may take a couple of years to reach Australia, though...

resolution and picture-on-the-wall formats that will carry us into the digital video era for the start of the next millennium.

Although we have already seen outstanding examples of flat screen displays, which most of us would like to fix to our walls like pictures, to hang from our ceiling like banners, or to attach to the rear edges of our desks (leaving the desktop free for our keyboards, books and paper), that wish is no longer a dream.

We already know that next generation of video screens and computer displays will initially focus on TFT LCD displays, in both small and medium sizes. We similarly know that the larger display formats will initially use medium and wide screen plasma displays. The size of those plasma displays will grow to satisfy market demands.

The current daunting prices of both the TFT LCD displays and the wide screen plasma displays are certain to drop dramatically once the scale and volume of production expands, as it must ultimately do. The cost of new video hardware will ultimately tumble, and those price reductions will undoubtedly be accelerated by other new technological developments, which we are about to observe.

The most critical of those developments, which has already been initiated in the USA, involves the next generation of digital, high-definition television. Digital television will provide us all with the potential to receive pictures and sound with definition and resolution which matches or exceeds the demonstration systems which the Sony Corporation showed me more than 10 years ago in Tokyo. Unlike the demonstration systems that I have seen, the new digital television format provides a format which can open up the possibility for simple purchasing, banking, communications, and home entertainment to a scope which is almost beyond comprehension.

Last year I was fortunate enough to view and to hear developmental prototypes of the next generation of digital television and its integrated multi-channel audio capability. By the time you are reading this, I hope to be in Las Vegas looking at the first examples of the type of production hardware that should be on the market in Australia and New Zealand in three years' time. I look forward to recounting what I have seen in forthcoming issues of *EA*.

GC: The most obvious advance in display technology in recent years has no doubt been the flat plasma display. These have all the benefits of standard cathode ray tubes, but don't suffer from problems with magnetic interference or convergence. Of course they are also flat (which is the whole point), with some domestic screens only 150mm thick.

I think, though, that as far as the consumer market is concerned they have turned out to be a bit of a flop, due mainly to their exceedingly high price.

Instead, I feel that the appearance of the flat panel LCD display as a replacement for the standard desktop monitor is the most significant innovation. Monitors such as Philips' 'Brilliance' 15" LCD screen, or even Apple's Studio Display are going to change the way we think about computer monitors, and the conventional deeper-than-it-is-wide CRT will soon sink into the depths of obscurity, along with the acoustic modem and vinyl LPs.

JR: Things have certainly come a fair way in this area. I guess the developments in displays that have impressed me the most in recent years are in the area of video and graphics projector technology, although I believe there's still a long way to go. The resolution and brightness are still barely good enough, while prices are still way too high to make them appealing for most home users. The same comments seem to

"I suspect most of us will still be watching CRT displays for a while yet..."

apply to the big plasma and field-emission panels that are just starting to become available, too.

When Texas Instruments announced its pivoting-micromirror-array technology a couple of years ago, I really thought we'd see some big steps forward in terms of image brightness and falling prices. But there must have been a few problems in making the transition from lab to market, because there still seems to be very few models actually taking advantage of this technology — and they don't seem to be noticeably cheaper.

Still, it's been good to see the evolution of medium-sized flat TFT-LCD colour screens for portable PCs, and the emergence of free-standing versions for desktop PCs in the latter half of last year. I didn't get a chance to see the Apple Studio Display 15" screen in action, but I did see the new Philips 151AX Brilliance monitor, and *that* was certainly impressive. Not just in terms of brightness, contrast, resolution and viewing angle, but also in terms of price.

What do I expect for the future? Perhaps large flat-panel displays will make a sudden leap in the next year or so, in terms of performance vs cost, but I'm not holding my breath. I suspect most of us will still be watching CRT displays for a while yet.

I have a feeling that we won't see much more real progress in this area until DVD and digital HDTV get well under way. After all, there's not much point in blowing up an image from VHS tape or even broadcast PAL to 'home cinema' dimensions — the resolution really isn't there.

Now that more movies are finally starting to be released on DVD discs coded for 'Region 4', DVD players like this high-end Pioneer DVL-909 will become more attractive in Australia and New Zealand. So perhaps 1999 will finally be the year that DVD 'takes off' here!

Video & still cameras

RE: Thanks to the large advances in CCD technology and memory capacity, digital video and still cameras are now a practical and affordable proposition for the average consumer. As the technology continues to improve and sales increase, digital still cameras are sure to replace the conventional automatic 'veggie' cameras found in almost every home, as we move into the next century.

While it's still a bit behind the eight-ball in terms of resolution, storage capacity and overall size, the Sony Mavica is a great way to move into digital photography thanks to the convenience and compatibility of its standard 3.5" floppy disk storage setup.

JR: What's impressed me the most in this area is the way digital still camera technology has really boomed in the last couple of years. The first few models on the market were expensive and really quite primitive in terms of image capturing performance, but since then the resolution and control functions have improved considerably, and the cost has been steadily falling. The latest models from Kodak, Olympus, Sony and others are really very impressive, with their megapixel image sensors, zoom lenses and in some cases TTL viewfinders.

Of course digital cameras are still not capable of quite the same performance as film cameras, and the prices remain significantly higher. So for many consumers, film cameras are still the more attractive option. However at their current rate of development, even this might well change in the next year.

On the video side, the new digital camcorders are very compact and give excellent performance, but prices are still too high. I guess I don't really see miniaturised rotating-head tape technology as having a long-term future, either. It's not really reliable enough, and doesn't lend itself to significant cost savings. Ultimately I think video will need to change over to an optical disc system — perhaps a compact form of DVD-RAM technology.

Home entertainment

LC: 1998 appears to have been a turning point, if not a year of technological transformation, in this country. 1998 was the year in which many of us realised that sound and vision, which we had conveniently treated as being separate and severable entities, could no longer be simply contemplated with such a narrow perspective.

Like it or not, your conventional CD, which clearly epitomised our perception of the latest and greatest development in acoustics, was clearly being white-anted by DVD. More disturbingly, the combination of digital sound and video technology augured for what will clearly become a cosy, if not a frighteningly symbiotic relationship.

Even the sampling rate and upper frequency limit of the conventional CD is now threatened by the 96kHz sampling frequency, and mind-boggling potential of a 24-bit digital sampling resolution. In a practical

A good example of the latest digital still cameras: Kodak's DC210 Zoom Plus, featuring an 1152 x 864 pixel image sensor coupled to a 2:1 zoom lens and 1.8" LCD display.


WHAT HI-FI?
Awards
1996
BEST BUY
'The 601s sound like the voice coils of God'
B&W DM601
"The 601s sound like
the voice coils of God."
What Hi-Fi? – Nov '95
B&W's patented method of
using Kevlar's unique woven
fibres for loudspeaker
cones has been a major
factor in reducing unwanted
standing waves.
For more information contact
Convoy International
on: 1800 817 787
www.convoyint.com.au
B&W
LISTEN AND YOU'LL SEE
READER INFO NO.3

and realistic sense, the 48kHz bandwidth and 144dB dynamic range offered by such parameters offers us little by way of realistic, practical, or audible advantage.

From this point onwards, and most certainly at the start of the new millennium, new technology will continue to favour a combined media in which both sound and vision will tend to be positively and inescapably entwined.

I am aware of a number of new developments in home theatre amplifier technology involving five and six channels of cost-effective amplification with matching digital processor circuitry, which is under development for small apartments, bedrooms and living rooms. The nifty new systems under development in Japan, the US and Europe will facilitate your placement of a DVD home video system in any sized room, dwelling or home. When combined with a TFT LCD or a plasma display, you will have the next generation of truly exciting home theatre DVD-compatible systems. The minuscule amplifier/speaker systems associated with the best of systems are likely to retail for marginally more than $1000.

RE: Audio-visual products for home entertainment don't seem to have been the sales bonanza that the major consumer electronics manufacturers were hoping for, with the public greeting much of the home theatre product releases with a stifled yawn. This situation hasn't been helped by the high turnover rate of decoding systems for movie soundtracks (analog, then digital AC3, and so on), plus of course the region encoding fiasco with DVD players.

As a consumer, all of this confusion means that you can easily end up with an A/V product that is quickly out of date or has very little supporting software, so you may as well spend the money on a new computer — which of course has become a home entertainment system in its own right.

With at least some of those troubles hopefully behind us, the future looks bright for home entertainment. The current generation of DVD players such as the Sony DVP-S715 clearly demonstrate the convenience and excellent performance of the format, and like audio CD players and conventional VCR's, the price should fall dramatically as sales volumes increase.

JR: I guess for me, the most impressive development in the home entertainment area last year was DVD video *finally* getting under way. Technically the latest generation of players seems to be capable of excellent performance — not just as video players, but also as 'audiophile grade' CD players. DVD has certainly been instrumental in pushing compact disc player technology forward, almost by default.

Mind you, like a lot of other people I'm still not really happy about the *software* side of DVD. The regional coding system has heavily stacked the market in favour of the software producers, with we consumers having very little say in what's available and when it may become available.

Although a bit more software was allowed to dribble onto the Australian market towards the end of 1998, the selection is still very limited compared with what's available in the USA. Incredibly when *Titanic* was released in October, for example, it was only released on VHS; they missed an excellent opportunity to really push sales of DVD players.

Korean firm Saehan Information Systems was the first to produce a pocket player for MP3 compressed digital audio, the MPMan. It's refilled with music from the 'MPStation' vending machine shown, with each MPStation linked to a central server for downloading.

It remains to be seen whether we poor souls in 'Region 4' will *ever* see many of the classic movies released on DVD, either, because of the relatively small market. Although it's possible to give old movies and other 'heritage' content an all-regions coding, this doesn't seem to have been done much as yet. So if you're a movie buff, your best plan is likely to be importing a Region 1 player directly from the USA, and then sourcing your discs from there as well.

Another area of entertainment electronics that I'd like to comment on is the way Australia has taken a leading role in the area of loudspeaker system design, in the last few years. Considering the country's relatively low population and weak manufacturing base, I continue to be impressed by the excellent design work and products turned out by pioneering Aussie firms like VAF Research, Sonique Audio and Duntech. They certainly seem to be up with the leading designers in the global marketplace, and achieving great things in terms of offering true high-end performance at a relatively affordable price.

It's sad that these firms generally don't have the recognition they deserve in their own country. They're probably better known and more highly regarded overseas than they are here.

Digital audio

LC: A backward glance at the outstanding CD players, CD recorders, Mini Disc recorders and amplifier systems that we reviewed in 1998 might lead you to think that the technology you've come to accept over the last decade will continue with little change into the new millennium. Some of those components or systems will most certainly maintain their role, or even their position in the marketplace for the first few years of the millennium.

Let's not kid ourselves, my crystal ball is probably only marginally less clouded than yours. When everything is said and done, we all have 20/20 hindsight, but very few have even 5/5 forward vision. The best that I can offer is some intelligent guesses and forecasts based on the new technology I've been fortunate enough to see while visiting various manufacturers' R&D laboratories overseas.

The most exciting audio developments which I believe are likely to be released in the next two to four years will be exemplified by the development of loudspeakers offering superior acoustical technology. Don't be surprised to see digital acoustical technology being deftly integrated into your amplifier's circuitry and even more excitingly, into the preamp's phase and amplitude processing stages, to achieve levels of fideli-

ty which we previously only dreamed about.

Don't be surprised either to see new developments in loudspeaker transducers, with piezo-electric transducers being revisited, in large flat-panel loudspeakers combined with some exciting digital electronic circuitry.

RE: The most exciting and significant events to occur in this area invariably revolve around 'real-time' audio and video signal compression. These relatively new and sophisticated techniques have brought us DVD players, internet-based streaming audio and the controversial MP3 files, plus of course the ill-fated replacements for audio cassettes: the Sony Mini Disc and the tape-based DCC system from Philips.

Fortunately, Sony appears to have breathed new life into Mini Discs of late, and (fingers crossed) this should lead to some new and exciting audio products — it's a great format, and deserves a second chance.

On the other hand, the way of the future in digital audio is probably summed up neatly in Diamond Media's amazing little 'Rio' music player, which can replay 60 minutes of MP3 audio from its 32MB flash memory. The era of *practical* no-moving-parts audio recorders appears to have arrived, and we should see a new generation of consumer products in a similar vein.

GC: MP3 is here, and, much to the chagrin of the RIAA and other regulatory bodies around the world, it's here to stay. Dubbed the JPEG of the audio world, MPEG Layer 3 Encoding has allowed people all over the world to record, store and exchange music quickly and easily.

Yes, the audio quality isn't perfect, and the format does lend itself to illegal music distribution via the Internet, but as an accessible, easy to use audio format, I think that MP3 has filled its role admirably. And this is only the beginning. With the release of Diamond Multimedia's Rio personal MP3 player, (amongst others) the future of MP3 as the dominant music format looks very promising.

Companies are now selling MP3 online, and there are now even MP3 vending machines, where you can top up your personal MP3 player. MP3 has its good and bad points, but if you ask me, it's the best thing to happen to digital audio since the introduction of the CD.

JR: Although there's been a quiet rebirth of Mini Disc in the last year, pushed by firms like Sony and Philips offshoot Marantz (surprisingly!), and the performance of the latest recorders and players does seem to be virtually indistinguishable from 'linear' CDs, I must confess that I still can't get too excited about this technology. Somehow it seems to have missed its window of market opportunity.

The area of compressed digital audio that I too find most promising is MP3, the MPEG1 Layer 3 audio that's currently booming (albeit unofficially) as a medium for sending music and other audio over the Internet. Like many people I've downloaded an MP3 player, installed it and used it to play various MP3 music files — and some of them are surprisingly good, despite being compressed by factors of as much as 20:1.

I'm particularly looking forward to seeing and hearing one of Diamond Multimedia's Rio PMP300, or Korean firm Saehan Information Systems' 'MPMan' handheld MP3 players, when they get released here. I certainly get the feeling that this kind of device may well end up as the 'Walkperson' music player of the future — no moving parts, nothing to wear out, just hours of compressed digital audio in your shirt pocket.

Silicon Valley startup Replay Networks has just released the ReplayTV, promoted as the digital replacement for your VCR. It's easily programmed to record up to 40 hours of video on internal hard disk drives.

The other main area of digital audio that's impressed me personally is home recording on CDR discs, using a PC. It's amazing how easy this has become, thanks to the availability of low cost CD-writer drives, large hard disks, sound cards and of course the right software.

I've been playing with this quite a bit in the last year or so; I started just after buying an HP 7200e CD Writer to go with my Pentium II system. Using software like Adaptec's Easy CD Creator Deluxe and CD Spin Doctor, Syntrillium's Cool Edit 96 and Diamond Cut's Audio Restoration Tools, I've found it surprisingly easy (and satisfying) to make 'cleaned up' CD copies of treasured old tape and vinyl recordings.

Frankly, I think this has been a very welcome development in audio technology.

"MP3 has its good and bad points, but if you ask me, it's the best thing to happen to digital audio since the introduction of the CD."

Personal computing

RE: The current state of computers and software seems like a runaway train, with little chance of stopping. PCs get faster, with larger storage capacity, and software bloats out to fill the gap — while we, the *users*, seem to end up with little overall benefit in terms of productivity or convenience.

There's no doubt that email, internet access and so on are a boon in this information-dependent age, but do we really need 40 megabytes worth of lumbering wordprocessor complete with that devil-incarnate Mr Paperclip, just to write a letter to aunty Maud?

Also, along the path to make PCs more accessible to the average user we seem to have taken a wrong turn somewhere, and have ended up facing reassuring messages like 'Trust us, we're Microsoft and we know best', as the software totally reconfigures your computer in its own image, then paints itself into a corner and locks up.

This is even more frustrating for technically inclined users who have a fair idea of what they *want* to do with the PC, but are forced to watch a 'helpful' operating system stuck in a cyclic argument with a 'helpful' system BIOS, over plug-and-play configurations.

This perhaps overly pessimistic view no doubt leads to a similar view of the future in personal computing, but the industry is notoriously hard to predict and has its own way of evolving with technology and user needs. So it's really a matter of jumping *on* the runaway train to seeing where it leads — or where it runs off the rails...

GC: OK, I'm going to be a little unconventional here. I'm not going to talk about the latest CPU, the recent breakthrough in high-speed modems or even the huge leap forward in colour inkjet printing performance over the last year or so. Instead, I'm

going to talk about one of the most significant changes to my computing environment: the Microsoft Intellimouse.

Microsoft mice have always been a cut above the rest, but with the release of their Intellimouse they have done themselves proud. The addition of a small rubber wheel situated between the two mouse buttons was an absolute brainwave, as it lets you scroll through long documents or windows simply by rolling the wheel with your forefinger. The action is so intuitive that you simply don't realise that you're using it, particularly when viewing web sites.

It doesn't sound like much of an innovation, I know, but the wheel completely changes the way you use your mouse, and to go back to the old fashioned style makes you realise how much you are missing. (I should add that the wheel also incorporates a third button, used for auto scrolling, but I don't use this function as much as perhaps I should.)

Keeping in the same vein, I wouldn't mouse anywhere without my 3M mouse mat — Sorry, 'Precise Mousing Surface' as they put it. It's just the right size and shape, and its back is slightly tacky, which secures it firmly to just about any surface. Its lizard skin surface texture suits the mouse admirably, and it is infinitely better than that old mattress-style foam thing you won at the computer show...

JR: Like many of *EA*'s readers, I guess, I'm getting a bit glazed over by the way PCs keep on getting ever faster and more powerful, for prices that continue to dribble downwards. It seems no time since I was writing my articles on one of the first IBM PCs — and now I write some of them on a 266MHz Pentium II, with a RAM capacity alone that's three times larger than the hard disk on that 1982 machine!

1998 also saw big developments in scanner technology, too. Canon's new CanoScan FB620P delivers true 600 x 600dpi colour scanning with 10-bit colour depth, again for an RRP of only $299.

Printer technology continues to race ahead, delivering higher performance for lower prices. Canon's new BJC-4310P Bubble Jet delivers photo-quality output yet has an RRP of only $299.

I really appreciate the terrific things you can do on a modern PC, too. Like scan and retouch photos, edit audio files, record CDs, draw your own diagrams, design PC boards, simulate circuits, exchange e-mail, surf the Web — and of course, lay out magazine articles.

All the same, as someone who struggled to write tight and efficient program code in the early days, I do get a bit irritated by the 'bloatware' approach embodied in so much of this modern software and its files. My old brain must be getting a bit rigid, because I can't really understand why some of the software has to be so huge, and save its data in what seems such a wasteful manner...

In the next year or so, I do expect big developments in the area of peripherals using the USB and FireWire buses. Judging by what I've experienced myself with USB so far, it really simplifies the business of adding peripherals like printers and scanners to your system. Now that USB-based digital speakers, cameras and other peripherals are appearing, enhancing our systems should soon have far fewer pitfalls and hassles.

Printers & scanners

RE: The advances in inkjet printer technology in recent years have been very impressive, with the major printer manufacturers developing high-resolution print heads, very accurate ink delivery systems and software-based enhancement for their low-cost printers. This has brought surprisingly high-quality black and white *and* colour printing into the SOHO market at a very low cost, as typified by printers such as Epson's 700-series inkjets.

We're sure to see the rapid improvements in inkjet printers continue into the future, and with any luck, they'll also manage to reduce the seemingly over-inflated prices of ink refill cartridges.

JR: I guess what's impressed me most about printers and scanners in the last year or so is the way manufacturers have been able to achieve faster printing and scanning speeds, *and* better resolution and quality, while at the same time steadily reducing the prices — or at least the initial prices. The ongoing prices are still very high in the case of inkjet printers, of course.

Although I've been a happy user of HP's laser printers, both at work and at home, I've also been very impressed by Brother's new low cost lasers. I bought one of their HL-1040s for my daughter a couple of months ago, for only $530, and it delivers excellent print quality — producing pages surprisingly quickly, too.

I'm really looking forward to trying out one of Hewlett-Packard's new HP 2000C inkjets, though. From the information I've seen to date, they look very impressive. I've had one of their older 660C inkjets for a while, and although the quality is fine the printing speed is quite poor compared with a laser. The ink cartridges are getting *very* expensive, too: a pair now costs around $130, yet a complete new 670C is currently selling for only $249!

With the new low-cost scanners, my only real gripe is that some of the software bundled with them seems to be little more than demo versions of the 'real' software you need to take full advantage of the hardware's capabilities. Still, I guess something has to be sacrificed in the relentless drive towards lower prices.

SONY

DVD VIDEO

Digital Cinema Sound

SONY DVD

The only player engineered to Hollywood standards.

Meet the total home cinema solution. Unlike other digital systems that merely mimic the movie theatre's digital sound, the DVP-S715 - in conjunction with Sony's uniquely developed Digital Cinema Sound (DCS) - actually recreates the acoustic characteristics of Sony's Hollywood studios where films like "Gone with the Wind", "Terminator II" and "Men in Black" were mixed. It not only offers playback of DVD's, but is also compatible with audio CD's and video CD's. In fact, the DVP-S715's performance equals Sony's award-winning ES (extremely high standard) CD players. Bring a touch of tinsel town to your home cinema with the new Sony DVP-S715. **It's a Sony**

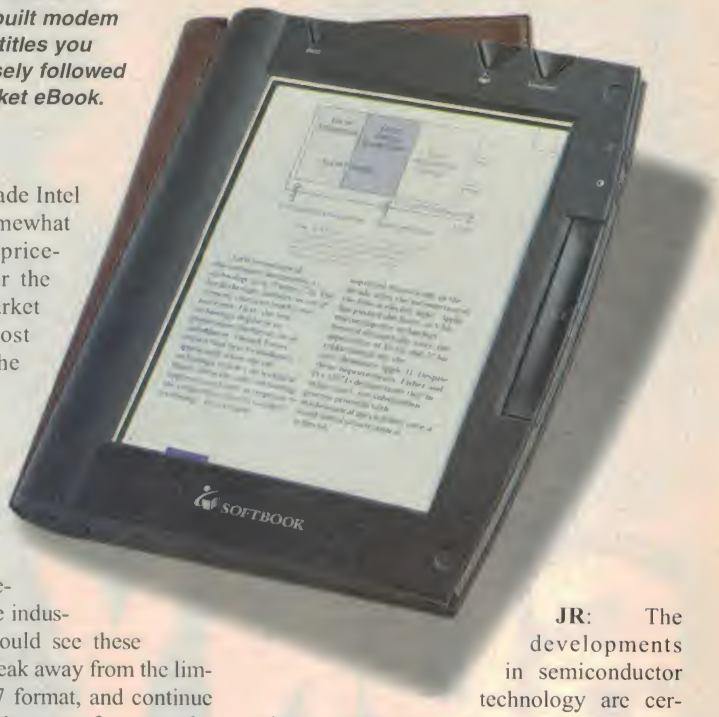
Communications

RE: We're clearly in the grips of a communications revolution which at the very least, will rival the historical significance of the industrial revolution. While the way we're influenced by this can range from high-tech satellite systems to the local cellular phone network, the part that has grabbed most of the media attention and arguably effected the most people in the developed world is the Internet. Typically used as a cultural influence by the young and an information resource by older users, the freedom and anarchy of the Internet has challenged our concepts of international and local law, censorship, intellectual rights and freedom of speech.

Put simply, the Internet has placed a huge amount of data at our fingertips, and made international communication both inexpensive and convenient. However, as corporate giants and powerful vested interests tighten their grip on the system, the Internet's future is certain to be embroiled in turmoil. Being dynamic by nature and having no real central authority though, the Internet will probably confound those who try to control it by growing new limbs (networks, in practice) as quickly as the existing ones are hacked off or tied down.

JR: It's amazing how rapidly we've all come to take the Internet/Web for granted, isn't it? Even using a 33.6kb/s modem, I get impatient when the web is sluggish and a multi-megabyte image or software file takes 15 or 20 minutes to download...

First of the new electronic books to hit the US market last year was the Softbook, with an inbuilt modem for downloading the titles you purchase. It was closely followed by NuvoMedia's Rocket eBook.



"Being dynamic by nature and having no real central authority, though, the Internet will probably confound those who try to control it..."

All the same, we've seen some tremendous developments in this area, and I look forward to what the next year or so will bring. I'm not holding my breath for a cable modem or ADSL, though — I doubt if many of us will be using these for a year or two yet. More's the pity, although the Internet's high-speed backbone is probably the main bottleneck now, anyway...

Chips & semiconductors

RE: The Intel apple cart has been somewhat tossed about by the emergence of alternative CPU manufacturers such as AMD and Cyrix, who have offered a number of processors that seem far better value for money than the Intel equivalent. At the very least, this has made Intel pull up their socks somewhat and develop new price-competitive CPUs for the 'lower' end of the market — such as the most recent release of the Celeron processor.

However with processors such as AMD's K6 grabbing large slabs of the market, it's fairly clear that Intel no longer has a stranglehold on that part of the industry. Hopefully, we should see these other manufacturers break away from the limitations of the socket-7 format, and continue to offer the public even better performance for their dollar.

GC: Hmm... Where do I start? Back in February 1998, Digital Equipment announced that it would have 1GHz CPUs in its Alpha processor range by the year 2000. One day later, IBM announced that it had not only designed, but had actually built a 1GHz CPU based on its PowerPC architecture.

Both of these announcements were significant milestones for the semiconductor industry, but what makes them even more interesting is the fact that the CPUs were designed and built without using some dramatic new chip technologies that were to pop up over the next few months, both essentially from IBM: copper interconnects and silicon on insulator (SOI) technology.

To top it all off, IBM have just announced a method of infusing the silicon base layer of ICs with atoms of germanium. This increases the conductivity of the substrate, and can result in chip speed increases of up to 100 times. One figure quoted is a 450MHz CPU boosted up to 50GHz! It seems to me that IBM have certainly come through with the goods, and should keep Moore's Law going well into the next millennium.

JR: The developments in semiconductor technology are certainly coming thick and fast now. Although the CPU chip speed race between Intel, AMD, IBM and Cyrix has perhaps been getting the most headlines, along with IBM's work on SOI (silicon on insulator), silicon-germanium chips and copper interconnect technology, there are so many developments happening in virtually all areas.

Firms like National Semiconductor, Analog Devices and Burr-Brown seem to be achieving comparable leaps in analog chips, while TI's development of 0.07um process technology looks as if it's going to allow very impressive developments in chip size, speed and cost across the board. So if anything, we can expect things to accelerate rather than slow down.

I note, for example, that US firm C-Cube has just announced a new single chip MPEG2 video CODEC which will allow low cost DVD-quality video recording and playback on home PCs — and presumably allow the cost of DVD video players to drop significantly too. I think we're likely to see this happen in the very near future.

Test & measurement

RE: While hardly a glamorous area of electronics, the degree of development and price-conscious design has probably never been higher in the test instrument arena. Thanks to a huge reduction in global military spending (particularly in the US), the major test instrument manufacturers have found themselves with fewer lucrative and extended purchasing contracts, and are now forced to pursue hard-nosed 'civilian' buyers.

The impressive part of this is that the manufacturers appear to have risen to the occa-

sion with some verve, resulting in a new breed of relatively low-cost, high performance but easy-to-drive instruments from companies such as Tektronix and HP. This is particularly apparent in display-based instruments like DSOs, which have now been resolved down to a high-performance A/D front end feeding a relatively powerful, dedicated computer. This type of 'intelligent' DSO can be programmed to operate in the same intuitive manner as a conventional analog scope, yet offer all of the storage and display advantages of its digital heritage.

The next generation of test and measurement instruments is sure to follow this path, using both simple and elaborate computer-based systems to control the 'user interface' and any peripheral functions. This in turn *should* give us even better value for money in future test instruments and lab equipment, as the trend continues.

GC: To be honest, I haven't seen much in the way of top of the line test equipment during the last year, but after having had the opportunity to play around with Tektronix' Digital Phosphor Oscilloscope I was firmly convinced that it beat everything else in the T&M category hands down.

The 'phosphor' is really a system of overlaying multiple digitised waveforms into a dynamic three-dimensional database. These layers of data are displayed in different colours, shades and intensities, and the resulting waveform displayed on the screen looks for all the world like a 'normal' phosphor trace. This, in addition to Tek's own InstaVu acquisition and display system meant that for the first time I was able to set up and see a constellation diagram on a digital scope. Tektronix should be proud of a well thought-out and innovative design, which I would rank as the best T&M product in 1998.

JR: I'm not just saying this because we're currently offering one as a subs prize, but the T&M development that's impressed *me* most in the last year or so is HP's new Infinium series of scopes. I had a preview of one of these when I visited their Colorado plants in mid 1997, and it really blew me away. HP's designers have managed to combine a high-end, high performance scope with a PC and Windows GUI, to achieve an amazingly 'friendly', flexible and yet easy to drive instrument.

Frankly I'd like to see a lot more of this kind of design, especially now that many test instruments are essentially PCs with dedicated front ends anyway. Hopefully we'll then see this kind of user friendliness start to appear on lower-priced instruments too.

Closing comments

LC: If we exclude music boxes from our assessment, the mechanical or electro-acoustic reproduction of sound has evolved over a single century. During that short period, technological developments, although painfully slow at the start, more recently seem to have galloped along at an ever so furious pace. The nett result of all this has been a rapid discarding of older and obsolescent technology for newer and more exciting equipment.

With few exceptions, each of those new developments has involved us in costly upgrades. More often than not, they have also involved us in greater outlays than we may have desired in order to gain the short-lived use or pleasure of each successive new techno-toy.

The fundamental problem is that the faster that manufacturers develop new and exciting technology, the greater the market resistance becomes to accept that technology with open arms. As with all such issues, the laws of supply and demand ultimately prevail (albeit in strange ways). As we have come to observe in recent months, even the smartest soothsayers don't always get it right in terms of the time-scale for forecasting major economic events. As always, the market's response to such complex pressures cannot be forecast by even the brightest crystal ball.

One more step in the relentless drive toward faster and faster chips: AMD's new 350MHz version of its AMD-K6-2 processor, with 3DNow! technology for faster 3D graphics performance. Their even faster K7 is expected by the middle of the year...

RE: The most dramatic change in the electronics industry in recent times really has to be the breakneck speed in computer development, which has now pretty much permeated every aspect of our lives. Fuelled by the equally rapid advances in semiconductor technology and insatiable needs of software, this trend is not going slow down in the foreseeable future.

We can expect to see further refinement in a range of 'primary' technologies such as semiconductor lasers and data storage mediums. But not surprisingly, the outlook looks inexorably linked to the all-conquering computer.

GC: Just like Christmas, isn't it? Let's see, things I would like to see in the near future (constraining myself to the electronics field, of course...) would include:

Socket 7 CPUs: I think that there is still a lot of life left in the Socket 7, and I've heard that a number of CPU manufacturers are going to stick with it for a couple more processor releases to come. A good thing too, I say, as I see Intel's licence on Slot 1 and Slot 2 as a blatant attempt to monopolise the motherboard market. Still, with motherboards so cheap these days, how long will it be before we end up with a chip-on-board, and do away with the socket altogether...

Smart cashcards: I'd really like to see these take off; Charge them up at an ATM (or at home via the web) and use them for small purchases without the need for a PIN. Buy your train tickets, newspapers or groceries without the need for change, and with greatly improved security and privacy over traditional credit cards.

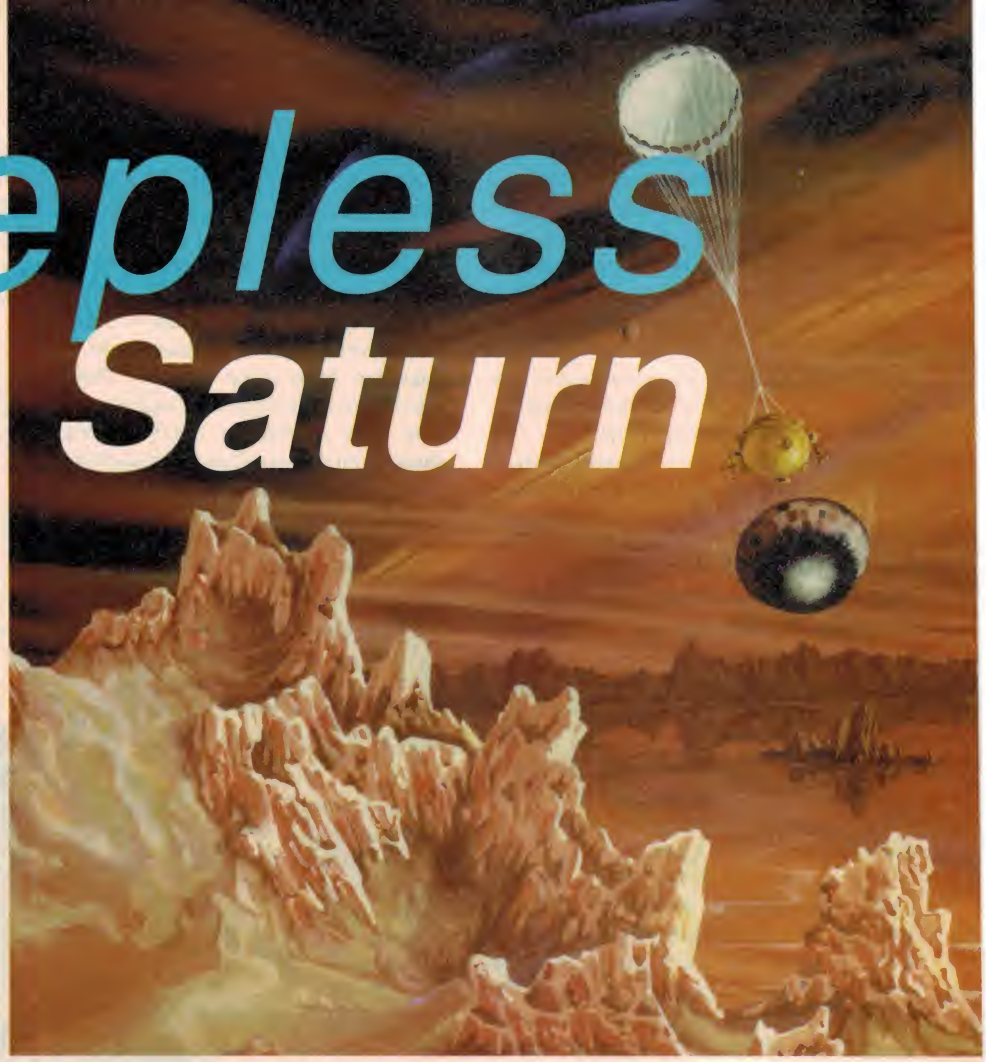
Two-way personal pagers: These are quite popular in Japan, and I would like to see them implemented here as well. Sort of like email on the run, without the phone bills. Most Australian phone companies offer a similar service with digital mobile phones, and so I think that the mini pagers with an alpha-numeric display would work well in the inner metropolitan areas.

Internet cash: Yes, a great idea — and the person who works out an economic way to charge 5-10 cents at a time will make themselves a fortune. I'd pay 12 cents for the latest video driver or software demo, and there are thousands more who would as well.

JR: In closing, I'd just like to add that I'm very impressed by the way so many firms in the electronics and computer industry are now making product data, application notes and other information available over the web, in Adobe's Acrobat format (PDF files). It's really great to be able to download all of this useful data, in such an efficiently compressed and readily accessible form.

Three more areas where I'm personally going to be looking at developments with great interest are electronic books (especially for textbooks), electronic distribution of music, and electronic cash using smart cards 'topped up' via the Internet using your PC and a low cost interface. Although none of these three is likely to 'take off' in a hurry, they all seem to have promise and I'm hopeful that they'll reach the market here in the coming year. ❖

Sleepless over Saturn



Late in 1997, an exploratory probe to Saturn and its moons was launched jointly by NASA and ESA. A two-part probe, it consists of the Cassini orbiter and the Huygens landing probe — both due to spring into action when they reach Saturn and its principal moon Titan in 2004. Here's the story behind the Cassini/Huygens mission and what's it's planned to achieve.

by Kate Doolan

Of all the nine planets in our solar system, possibly the most beautiful is Saturn, a gas planet surrounded by a system of thousands of rings — formed from particles ranging from the nearly invisible, to icebergs the size of a house.

Since the beginning of planetary exploration by the US National Aeronautics and Space Administration (NASA), three robot spacecraft have made brief flybys of Saturn. Pioneer 11 flew by Saturn in September 1979, Voyager 1 flew past Saturn on 12 November 1980 and Voyager 2 flew by on 25 August 1981. The data returned by these three flybys whetted the appetite of planetary scientists, who wanted to study the planet and its fascinating system of moons in greater detail.

Now, 17 years after Voyager 2 flew past Saturn, there is another spacecraft bound for the giant ringed planet. The Cassini/Huygens spacecraft, launched on 15 October 1997, is a joint project of NASA and the European Space Agency (ESA) and will be arriving at Saturn on 01 July 2004. There Cassini will orbit the planet for at least four years, while Huygens will make a spectacular descent through the atmosphere of the moon Titan — and if it survives the descent, will make observations of one of the most enigmatic bodies in the solar system.

The Cassini/Huygens project was conceived in 1982, when a joint working group was established by the Space Sciences Committee of the European Science Foundation and the Space Science Board of the United States' National Academy of Sciences. After travelling through various bureaucratic processes, the project received approval from ESA's Program Science Committee in 1988.

The Cassini spacecraft was supposed to be different from other planetary spacecraft, as it was to be part of a new generation of spacecraft known as 'Mariner Mark IIs'. The idea was to develop and construct a fleet of standardised spacecraft that would explore Saturn, Uranus, Neptune, Pluto and possibly the asteroids. These grandiose plans hit a road bump after the launches of Voyagers 1 and 2 in 1977, as NASA failed to launch another planetary spacecraft for 12 years until the Magellan and Galileo launches in 1989.

During this time, the US budget deficit exploded and NASA's planetary scientists were told to trim their ambitions. Their solution was to build spacecraft stacked with as many scientific instruments as possible. The Mariner Mark IIs were reduced to two spacecraft — Cassini and CRAF. In 1989, Congress placed a US$1.6 billion cap on Cassini and CRAF. However in 1992, the Bush administration cancelled CRAF. NASA's HQ then ordered engineers and scientists at the Jet Propulsion Laboratory in Pasadena, California to redesign Cassini to reduce its cost.

To achieve this, engineers retained all 12 scientific instruments but removed the spacecraft's scan platform and rotating turntable, which would have aimed cameras and other sensors. Instead, the cameras and sensors were fixed directly to Cassini — which meant the whole spacecraft must be manoeuvred to aim the instruments. As a result of this, Cassini will not make as many simultaneous observations and will collect less information. NASA/JPL also chopped the budget by dropping plans for Cassini to study an asteroid and Jupiter enroute to Saturn.

Spacecraft details

The Cassini spacecraft stands 6.8 metres high and is 4m wide. A magnetometer is mounted on a 13m boom that extends outward from the spacecraft. Three other rod-like antenna booms measure 10m in length and extend out from Cassini in a Y-shape. Most of the spacecraft and its instruments are covered with a multilayer amber

coloured or matte black blanketing material. This material protects Cassini from the extreme heat and cold of the space environment and also to maintain the operating temperature required for computers and other electronics systems.

The Cassini orbiter itself weighs in at 2125kg. When the Huygens probe and launch vehicle adaptor were attached and 3132kg of propellant loaded, the spacecraft weighed 5712kg at launch. More than half of the spacecraft's mass is the propellant that will be required for the 94-minute main engine firing as it brakes into orbit around Saturn.

Cassini's complexities are necessitated by both its flight path to Saturn and by the ambitious scientific program once it arrives at its destination. The spacecraft has more than 12km of cabling linking its computers and mechanical devices, and 22,000 wire connections.

The main body of the orbiter is a nearly cylindrical stack comprising a lower equipment module, a propulsion module and an upper equipment module that is topped by a fixed 4m high-gain antenna. Approximately halfway up the stack is a remote sensing pallet which contains cameras and other sensing equipment, and a particles pallet containing instruments that will study magnetic fields and charged particles. These two pallets contain most of Cassini's scientific instruments. The whole spacecraft must be turned to point instruments in the correct direction, although three of the instruments provide their own articulation about one axis.

Software sequences stored in the spacecraft's computer direct the activity of the spacecraft. A typical sequence can operate Cassini for a month without the need for ground controller intervention. The onboard computers are designed to withstand the radiation of deep space, especially when the Sun is at its peak activity. (Solar flares, which can last for days, can deliver radiation 1000 times above the usual radiation levels in outer space.) Cassini's electronics underwent customised radiation hardening to ensure that they would not be disrupted or destroyed during such events.

Sophisticated fault protection software resides in the spacecraft's computers to continuously sample and sense the health of all onboard systems. The fault protection system automatically makes corrective action when the spacecraft is at risk due to any onboard failures.

Radioisotope power

The orbiter receives electrical power from three 'radioisotope thermoelectric generators' (RTGs). These produce power by converting heat into electrical energy. The RTGs are not reactors and the radioactive material is neither fusionable or fissionable. Heat is provided by the natural radioactive decay of plutonium in ceramic form — mainly Plutonium-238. Devices called thermocouples turn the heat into electricity to operate the spacecraft. Upon arrival at Saturn, the three generators will provide about 675 watts of power.

Plutonium dioxide is also used as a heat source, in 82 small Radioisotope Heater Units (RHU) on the Cassini orbiter and 35 on the Huygens probe. Each RHU produces about one watt of heat to keep nearby electronics at their desired operating temperatures. Both the RTGs and RHUs have a long (and safe) heritage of use in NASA's planetary program, including the Voyager and Galileo missions.

Propulsion for major changes to Cassini's trajectory is provided by one of two main engines. These engines use monomethylhydrazine as the fuel and nitrogen textroxide as the oxidiser. Sixteen smaller thrusters use hydrazine to control Cassini's orientation and to make minor adjustments to the spacecraft's flight path.

Guidance and control is governed by sensors that recognise reference stars (plus the Sun) and by the onboard computers that determine the spacecraft's position. Using a newly developed gyroscope that vibrates rather than spins, the spacecraft can perform twists, turns and propulsion firings whilst

Saturn

and our knowledge of it...

Named after the ancient Roman god of agriculture, Saturn is the sixth planet from the Sun and the second largest planet in our solar system. It is 1.4 billion kilometres from the Sun, and a Saturnian year lasts 29.46 earth years. A day on Saturn lasts 10 hours and 40 minutes and the planet consists mainly of helium and hydrogen.

The first person to view Saturn through a telescope was Italian astronomer and my favourite Renaissance man Galileo Galilei (1564-1642), who viewed the planet during the years 1609-1610. Galileo was unable to make out the ring system surrounding the planet and after a viewing two years later, determined that the planet has some form of 'arms' that grew and disappeared for unknown reasons. Galileo died before knowing that he had been the first person to observe Saturn's rings.

In 1659, using a better telescope, Dutch astronomer Christiaan Huygens (1629-1695) determined that the 'arms' of Saturn were not appendages, but 'a thin flat ring which nowhere touches the body'. His theories were met by some ridicule, but in time were confirmed by English astronomer Robert Hooke (1635-1703) and Italian/French astronomer Jean-Dominique Cassini (1625-1715).

Whilst observing Saturn, Huygens also discovered the moon Titan. Several years later and using a new telescope, Cassini discovered the moons Iaepetus, Rhea, Tethys and Dione. In 1675 Cassini also discovered that Saturn's rings were split largely into two parts by a narrow gap — now known as the 'Cassini Division'.

Saturn's hazy yellow colouring is marked by atmospheric bands which are fainter than those on Jupiter, although from time to time spectacular atmospheric storms have been observed — most recently by the Hubble Space Telescope during 1990 and 1995.

Saturn has 18 satellites (or moons), with Titan being the largest and most fascinating. Titan has held scientists' interests for years because of its dense and rich nitrogen-methane atmosphere.

The Hubble Space Telescope recently observed on Titan oceans and land masses the size of Australia. With the thick atmosphere, seas and a tarlike permafrost, Titan is thought to harbour organic compounds that may help determine the chain of chemistry that led to life on Earth.

retaining continuous knowledge of its own position. The Cassini orbiter is stabilised along all three axes and does not normally rotate during its flight to Saturn.

Trajectory a challenge

The mission's trajectory poses a challenge for controlling the spacecraft's temperature, as in the first several years of its flight, the orbiter will be relatively close to the Sun. During this time, the high-gain antenna will be pointed towards the Sun and used as a sunshade to shield the rest of the orbiter and the probe. Special paints have been used on the antenna to reflect and radiate much of the sunlight received.

Communications with the spacecraft during its flight through the inner solar system will be by one of the orbiter's two low-gain antennas. In January 2000 as Cassini enters the asteroid belt and beyond, it will turn its high-gain antenna towards Earth and will conduct communications with this antenna for the remainder of the mission.

As Cassini travels further from the Sun, extreme cold will become a major concern. At Saturn's distance, the intensity of sunlight is approximately 1% of that at Earth. Heat within the spacecraft is retained by using lightweight, multiple-layer insulating blankets that have been tailor-made for the instrument housings and other areas of the orbiter.

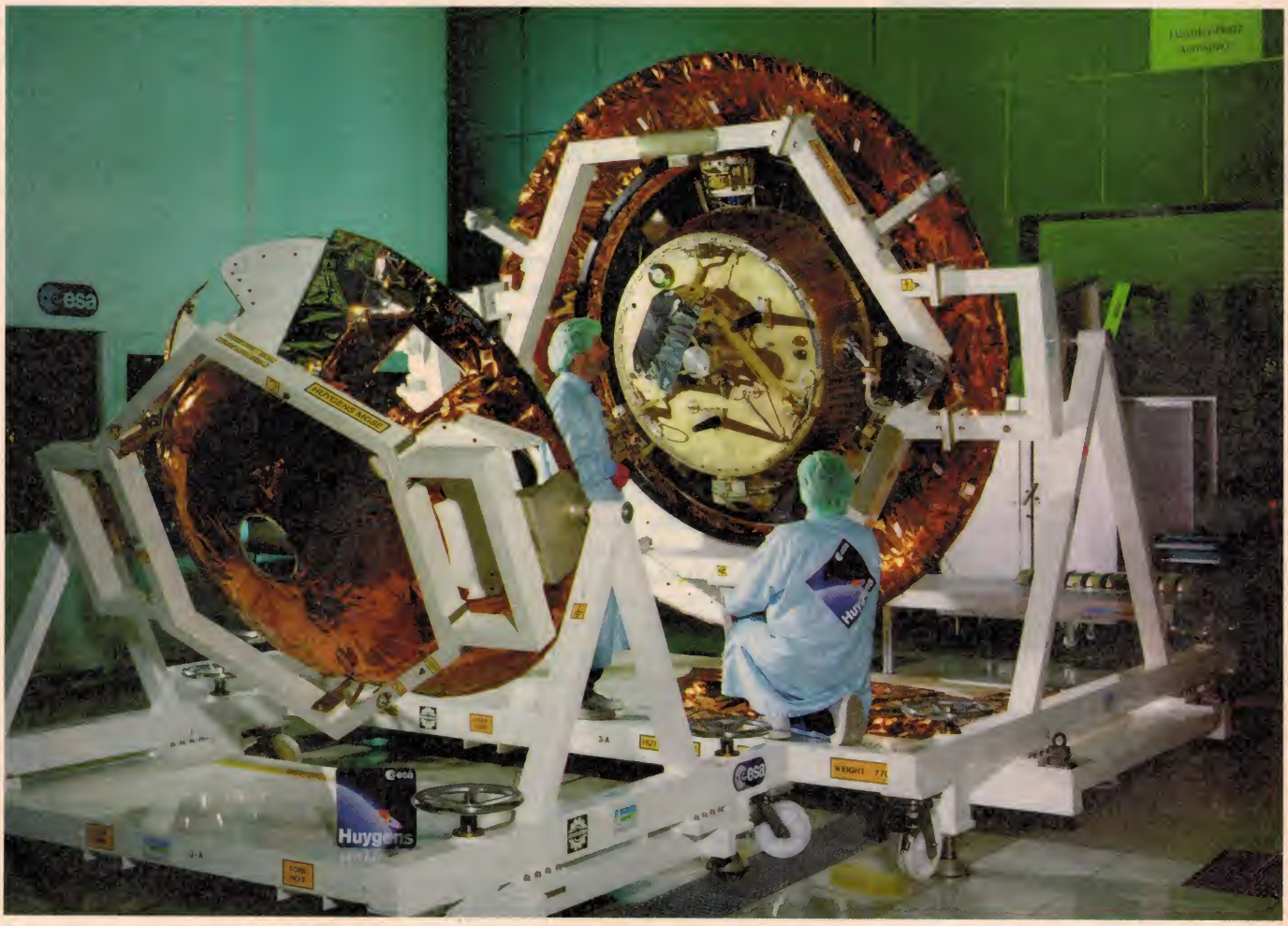
The Cassini spacecraft contains a variety of engineering subsystems that control spacecraft functions including wiring, computing, electrical power, guidance, telecommunications and propulsion. The structure itself provides mechanical support and alignment for all flight equipment, including the Huygens probe. It also provides an equipotential container — an electrical grounding reference which provides a shield from radio frequency interference, and protection from radiation and micrometeoroids.

The radio frequency subsystem provides telecommunication facilities for the spacecraft and is also used as part of the radio science instrument. For communications, it produces an X-band carrier signal at a frequency of 8.4GHz; modulates it with data received from the command and data subsystem; amplifies the X-band carrier to produce 20 watts from the travelling wave tube amplifiers and delivers the signal to the antenna subsystem.

From the antenna subsystem in turn, the RF subsystem receives signals from Earth at a frequency of 7.2GHz; demodulates them and delivers the commands and data to the command data subsystem for storage or execution.

Regulated electrical power and various small pyrotechnic devices on the spacecraft are controlled by the power and pyrotechnics subsystem. Operating on command from the central computer system, this subsystem distributes electrical power to instruments and other subsystems on the spacecraft at 30V DC. The subsystem also regulates a shunt radiator that can be used to dispose of excess heat. The pyrotechnics include squib devices that will be fired to cut cables and other links that hold the Huygens probe onto the orbiter.

The command and data subsystem is Cassini's nervous system — the central processing and delivery clearing house of the spacecraft for commands received from the Earth and data to be sent back to it. All elements of the subsystem are duplicated, with



Assembling the Huygens probe inside its heatshield and back cover assembly. The heatshield is covered with highly efficient silica-fibre tiles, but is in turn enclosed in a delicate thermal blanket. One of the 'signature' discs is visible at upper centre, just above and to the right of the standing technician's head. (Photo ESA)

redundant components that can be used in the event of a component failure. The subsystem receives ground commands and other data from the RF subsystem, processes the data and distributes it to other subsystems. It uses two redundant solid-state recorders and flight computers which are programmed in the Ada programming language. Memory capacity for each solid-state recorder is 2GB.

Scientific and engineering data from science instruments destined for transmission to Earth is first forwarded to the command and data subsystem for processing and formatting for telemetry and delivery to the RF subsystem. The command and data subsystem contains software routines that protect the spacecraft in the event of a fault. The software also allows the spacecraft to autonomously respond to faults that require immediate action. Memory for the command and data subsystem is 512K words of RAM and 8K words of PROM.

The attitude and articulation control subsystem is the spacecraft's ear, continuously sensing and measuring the spacecraft's orientation on its three axes and its position in space relative to Earth, Saturn, the Sun and other targets. It provides measurements and controls pointing for spacecraft instruments including scans that require the spacecraft to roll whilst an instrument performs an observation. The attitude and articulation control subsystem has a number of sensors including redundant Sun sensor assemblies, star trackers, a Z-axis accelerometer and two three-axis gyro inertial reference units. The subsystem also contains actuators for the main rocket engine gimbals and for the redundant reaction wheel.

With two redundant computers programmed in Ada, the subsystem processes commands from the command and data subsystem and produces commands to be delivered to attitude control actuators and/or spacecraft thrusters or main engines to control Cassini's attitude and to make trajectory changes. The attitude and articulation control subsystem has 512KB of RAM and 8KB of PROM.

The propulsion module subsystem controls the spacecraft's thrust and changes in its attitude, working under the command of the attitude and articulation control system. Attitude control is provided by the reaction control system, which consists of four clusters of four hydrazine thrusters each. These move the spacecraft to or maintain it in its desired orientation, and are used to point the instruments at their targets. The thrusters are also used for executing small spacecraft manoeuvres.

For larger changes in the spacecraft velocity, the main rocket engine is used. Cassini has a primary and redundant pressure regulated main engine, each capable of a thrust of 445 newtons. The bipropellant main engines burn nitrogen textroxide and monomethylhydrazine, and are gimballed so that the thrust vector can be maintained through the shifting centre of mass of the spacecraft.

Pre-launch operations on Cassini's propulsion module, at KSC's Spacecraft Assembly and Encapsulation Facility-2. There are twin 445-newton main engines. (NASA photo)

The solid state recorder is the primary memory storage and retrieval device for the orbiter. Before completion of the Huygens descent probe's mission, only one recorder can be used at any one time to store science data. However after the Huygens mission, both recorders can be used to record and play back science data. Data such as spacecraft telemetry and memory loads for various subsystems may be stored in separate files on the recorder.

The antenna subsystem provides a directional high-gain antenna that can transmit and receive on four different bands in the microwave spectrum — X, S, Ku and Ka. The high-gain antenna and low-gain antenna #1 were provided by the Italian Space Agency. Low-gain antenna #1 is located on the dish structure of the high-gain antenna. Low-gain antenna #2 is located on the Cassini orbiter body below the attach point for the Huygens probe.

During the inner solar system cruise when the high-gain antenna is pointed towards the

Sun to provide shade for the spacecraft, the two low-gain antennas allow for one or the other to transmit and receive X-band signals to and from Earth. They can also be used for emergency telecommunications whilst Cassini is at Saturn.

As with all NASA planetary missions, the Deep Space Network will be playing a pivotal role. The DSN with complexes in Spain, California and at Tidbinbilla in the ACT will be the main communications link with Cassini/Huygens and once Huygens has separated from the orbiter, data will be transmitted to the ESA operations complex in Darmstadt, Germany.

Main instruments

The Cassini orbiter has 12 scientific instruments, but because of space considerations I will only be listing here two of the most important.

The Imaging Science Subsystem or Cassini's cameras will be photographing a wide variety of targets — Saturn, Titan, the rings and the other 17 moons, from a broad range of observing distances and for various scientific purposes. General science objectives include studying the atmospheres of Saturn and Titan, the rings and their interactions with the planet's moons and the surface characteristics of the moons including Titan.

The ISS includes both narrow-angle and wide-angle cameras. The narrow-angle camera provides high resolution images of targets of interest, while the wide-angle camera provides more extended spatial coverage at lower resolutions. The cameras can also obtain optical navigation frames — images of Saturn's moons against a star background.

The Cassini Radar will investigate the surface of Saturn's moon Titan. Titan is covered by a thick, cloudy atmosphere that is hidden to normal optical view, but can be penetrated by radar. This instrument is based on the same imaging radar used on the Magellan to Venus mission and the Shuttle Imaging Radar flights. Scientists hope to determine whether oceans exist on Titan and if so, determine their distribution, investigate geological features and the topography of Titan's solid surface — plus acquire data on other targets such as Saturn's rings and moons, as conditions permit.

The 320kg Huygens probe is being carried to Saturn by Cassini. The Huygens probe was constructed by Aerospatiale, with equipment supplied by many European countries under the auspices of the European Space Agency. Bolted to Cassini and fed electrical power through an umbilical cable, Huygens is travelling along during the seven year journey largely in a hibernation mode, woken every six months for a three-hour instrument and engineering checkup.

Environmental Health Specialist Jamie Keeley of EG&G Florida Inc uses an ion chamber dose rate meter to measure radiation levels from one of Cassini's three radioisotope thermoelectric generators (RTGs). (NASA photo)

Will cut loose

Three weeks before it is scheduled to hit Titan's atmosphere on 06 November 2004, Huygens will be released from Cassini. With its umbilical cut and bolts released, Huygens will spring loose and fly on a ballistic trajectory to Titan. The probe will spin at seven revolutions per minute for stability. Onboard timers will switch on the probe systems before it reaches Titan's atmosphere.

Two days after Huygens' release, Cassini will perform a deflection manoeuvre that will keep it from following the probe into Titan's atmosphere. This manoeuvre will also establish the required geometry between the probe and the orbiter for radio communications during the probe descent, and will also set the initial conditions for Cassini's tour of Saturn's moons — which starts immediately after the completion of the Huygens mission.

The Huygens probe carries two microwave S-band transmitters and two antennas, both of which will transmit to Cassini during the probe's descent. One stream of telemetry is delayed by six seconds with respect to the other, to avoid data loss if there are brief transmission outages.

The probe descent is planned to take place on 27 November 2004. Huygens will enter Titan's atmosphere at a speed of 20,000km/h. It is designed to withstand the extreme cold of about -200°C and the intense heat that it will encounter during atmospheric entry — 12,000°C.

Huygens' parachutes will further slow the descent so the probe can conduct an intensive program of scientific observations all the way down to Titan's surface. When the probe's speed has moderated to 1400km/h, the probe's aft cover is pulled off by a pilot parachute. An 8.3m diameter main parachute is then deployed to ensure a stable and slow descent. The main parachute slows the probe and allows the decelerator and heat shield to fall away when the parachute is released.

Cassini's high-gain parabolic antenna being transported in the Payload Hazardous Servicing Facility at KSC, by employees from NASA's Jet Propulsion Laboratory. Transmit and receive links operate in the X-band, at 8.4GHz and 7.2GHz respectively. (NASA photo)

To limit the duration of the descent to a maximum of 2.5 hours, the main parachute is jettisoned 15 minutes after the probe has entered the top of the atmosphere. A 3m drogue chute then deploys to support the probe for the remainder of the descent. The batteries and other resources are sized for a maximum duration of 153 minutes, which will include at least three minutes on the surface — but possibly up to 30 minutes if the descent takes less time than expected.

During the first part of the probe's descent, the instruments aboard Huygens will be controlled by a timer. But during the final 10 to 20km of descent, they'll be controlled on the basis of altitude measured by the radar altimeter.

Huygens' descent imager and spectral radiometer will take pictures of cloud formations and Titan's surface. As the probe nears impact, its surface science package will activate a number of instruments to measure surface properties. It will impact the surface at 25km/h, with the chief uncertainty being whether its landing will be a splashdown or a thud. If it lands in liquid, the instruments will measure the liquid's properties whilst the probe floats for a few minutes.

If Huygens lands in liquid ethane, it will be unable to return data for very long because the extremely low temperature of this liquid (-180°C) would prevent the batteries from operating. In addition, if the liquid ethane permeates the probe's science instrument package, the radio would be badly detuned and possibly would not operate.

If the probe continues to send data to Cassini from Titan's surface, it will be able to do so for a maximum period of 30 minutes when the probe's battery power is expected to run out. The Cassini orbiter will also have disappeared over the probe's horizon.

At the end of the Huygens mission, Cassini will continue its four-year orbital tour. This consists of more than 70 orbits around Saturn, shaped by gravity-assist flybys of Titan or by firing of the spacecraft's thrusters. The size of these orbits, their orientation to the Saturn-Sun plane and their inclination to Saturn's equator are dictated by various scientific requirements. These include imaging radar coverage of Titan's surface, flybys of selected icy moons, Saturn or Titan, occultation by Saturn's rings and crossings of the ring plane.

Cassini will make at least six targeted flybys of selected icy moons of greatest interest — Iaepetus, Enceladus, Rhea and Dione. Images taken with Cassini's high-resolution telescopic camera during these flybys will show features equivalent to a size of football ground.

The prime mission tour is planned to conclude on 01 July 2008, four years after the arrival at Saturn and 33 days after the last Titan flyby. The aim point of the final flyby is chosen to position Cassini for a Titan flyby on 31 July 2008, which may provide the opportunity to proceed with more flybys during an extended mission, depending on resources.

Launch hitch

Cassini/Huygens had a launch window that ran between 06 and 20 October 1997. The daily launch window ran for 140 minutes each day.

One unusual hitch occurred before the launch. As the spacecraft was carrying plutonium, conservation groups tried to stop the launch by both demonstrations and legal means. Several weeks before the launch, at least 25 demonstrators were arrested for trying to get to the launch pad — at least one person offered to sit down on the pad at the moment of launch! In a legal ruling following the Galileo and Ulysses precedents, the Justice Department in Hawaii refused to issue an injunction to stop the launch.

Due to high winds on 13 October 1997, the launch took place successfully two days later aboard an Titan IV/Centaur rocket from the Cape Canaveral Air Force Station in Florida at 4:43am (local time). Seventy minutes later, the spacecraft successfully made contact with the DSN station at Tidbinbilla in the ACT.

As the launch vehicle did not have enough power to send Cassini/Huygens straight to Saturn, it will make several gravity-assist flybys during its journey to Saturn. The first one was at Venus on 21 April this year, at a distance of 300km. The second will also be around Venus on 22 June 1999, at a distance of 1530km, followed by Earth on 17 August 1999 at distance of 800km and Jupiter on 30 December 2000 at a distance of 10 million kilometres.

In an unusual twist to finish this story, in August 1997, a small digital versatile disc (DVD) was installed aboard the Cassini spacecraft. The disk contained a record of 616,400 signatures from 81 countries around the world. Signatures were received from people of all ages and backgrounds — including your scribe! The European Space Agency also attached a disk to the side of Huygens.

On both discs, the signatures of both Jean-Dominique Cassini and Christiaan Huygens were scanned in from letters they had written to each other in the 17th century. So while both gentleman cannot see what their namesakes will do, they will be 'along for the ride' with the rest of us!

In closing, the author wishes to thank Colin Burgess, Deb Dodds of the Johnson Space Center, Mary Hardin of the Jet Propulsion Laboratory, Maggie Persinger of the Kennedy Space Center, Jean-Pierre Provost (formerly of the European Space Agency) and Steve Fleming 'The Starry Messenger', for their assistance in the completion of this article. All photographs are courtesy of Dornier, ESA and NASA. ❖

Forum

Conducted by Jim Rowe

Electrotherapy devices: comments from an Irish researcher

You won't be surprised, I'm sure, to hear that I've had another missive about electrotherapy devices. This time it's from a researcher based in the Republic of Ireland, who seems to be involved in ongoing study of the use of transcranial electrostimulation in treating drug and alcohol addiction. He's essentially responding to the columns earlier last year discussing Dr Robert Beck's devices — including the 'Brain Tuner'.

IT'S AMAZING, at times, how far afield our magazine *does* manage to travel, in terms of reader interest and reaction. Especially when we run articles of a somewhat controversial nature! This latest letter comes all the way from Eire, on the other side of our shrinking world, from Mr Lorne Patterson RMN. I can't clain Mr Patterson as a regular reader, though — it seems he was sent a copy of last April's Forum column by an Australian friend.

I can't decode the letters 'RMN' after his name, but presumably Mr Patterson is either a qualified medical nurse or neurologist. In any case he seems to be heavily involved in an international research group studying the use of NeuroElectric Therapy or 'NET', in areas such as drug and alcohol detoxification.

From some of the material Mr Patterson enclosed with his letter, my impression is that NET is at least broadly similar to transcranial electrostimulation (TES or CES), with signals applied to electrodes on each side of the head, just behind and below the ears. It seems to have been developed in the early 1970s by Margaret ('Meg') Patterson FRCSE, who is a member of the same research group.

My impression also is that while Mr Patterson and his colleagues are basically inclined to believe that NET offers definite therapeutic benefits, at the same time they seem very keen to carry out objective and reproduceable research, in order to establish its credibility properly in the scientific sense. As a result, they seem to be quite unhappy about some of the rather way-out claims made by others in the 'alternative electrotherapy' area — including (you guessed it) Dr Robert Beck and his representatives.

In fact Mr Patterson's position seems to me fairly well encapsulated by a quote he gives in one of his papers, made originally by Professor P. Rosch in an 1994 editorial in *Stress Medicine*, published by the American Institute of Stress. The comment was made with reference to the overall field of what Mr Patterson describes as 'subtle energy medicine':

It is essential to provide a critical scientific platform that insists on objective proof to ensure the authenticity of such novel approaches. Otherwise, it will be impossible to distinguish them from the host of worthless imitation products flooding the market with spurious claims.

I don't know about you, but I only wish other people working in this area — and promoting various products — could adopt the same approach! Anyway, with those preliminary comments, here's Mr Patterson's letter:

I've been passed a copy of your 'Forum' column (Electronics Australia April 1998) by a friend in Australia. As one of the group of practitioners who wish for critical investigation of our device-treatment claims, I was pleased by your article and your desire to separate the wheat from the chaff. I am also concerned that your investigation into Bob Beck and his claims hasn't yet reached deep enough.

First, our transcranial electrostimulation treatment, Neuro-Electric Therapy. I enclose two peer-reviewed articles for your interest. The first, 'Clinical Criteria' is a brief review of the electrical and clinical criteria involved in those clinicians/scientists who have published results in the field of drug and alcohol detoxification by electrostimulation — my specialty. The second, 'Standards', is a response to concerns such as yours and their urgency; my view on the nature of the problem based on my experience in the USA and my views on the key issues to be resolved in dealing with them on a critical basis.

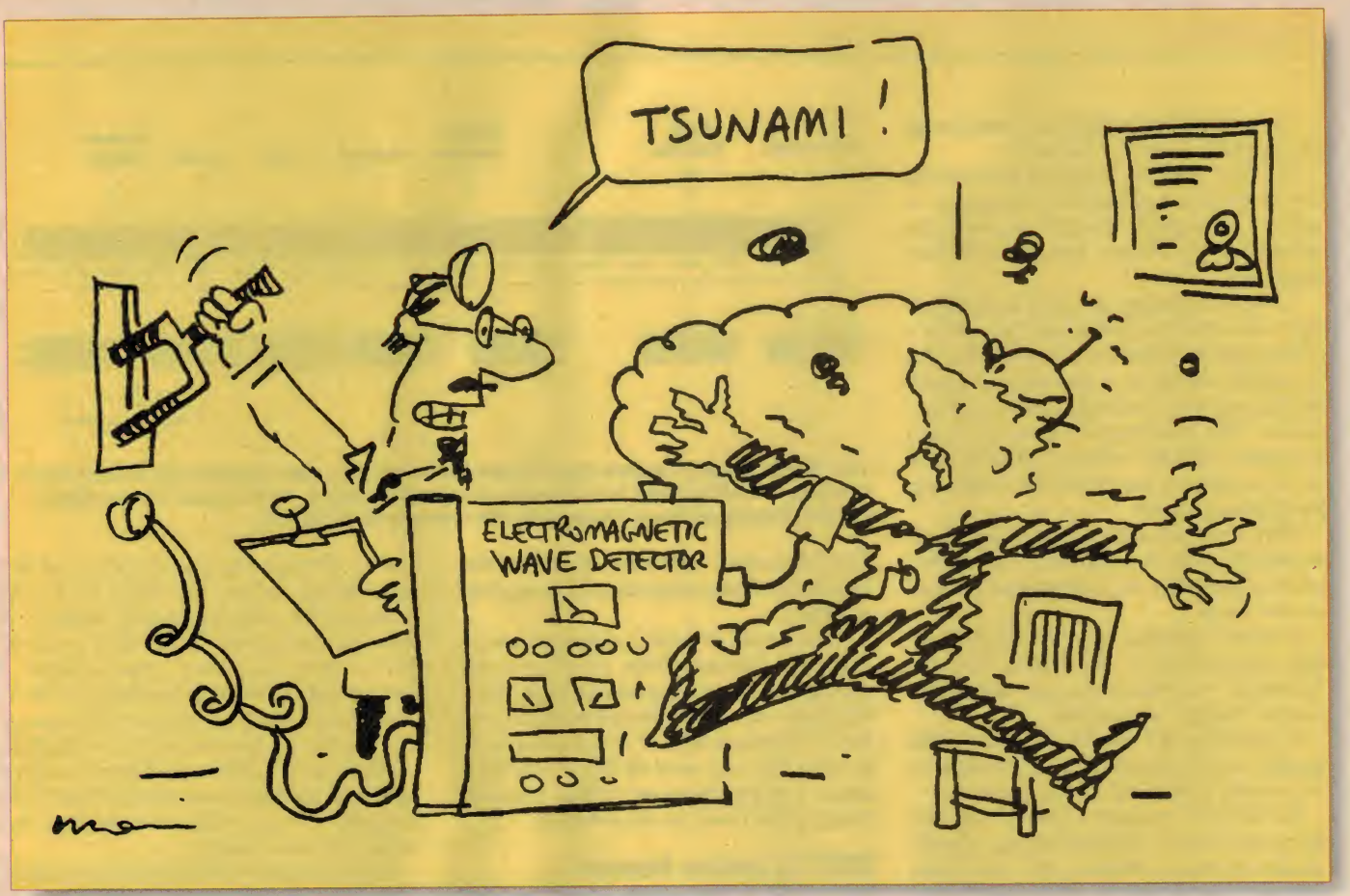
Australians treated

*Over the years we have treated a number of Australians in England ('Beyond 2000' did a segment on NET back in 1988). In 1993, we introduced our computerised, preprogrammed NET (see 'Clinical Criteria') into Australia, through a Melbourne nurse, Liz Stephens RN (**gnet@sympac.com.au**) — primarily, but not exclusively, for the treatment of prescription-tranquilliser dependents. The first of a two-part article on our preliminary results from Oz is currently under peer-review by an Australian nursing journal. We hope the article will lead to an official broad-based clinical investigation into our claims.*

As regards Beck (not to be confused with Robert O. Becker, a leading authority in the field of electro-medicine and electro-pollution), I am unaware of his 'Blood Cleaner', but have long knowledge of his 'Brain Tuner' (BT series of stimulators) and his claims for efficacy in the treatment of the addictions.

Unlike your report into his blood unit,

Here's a front view of the Bicom 'Regumed' therapy unit, as found in the surgeries of some Australian medical centres. Made in Germany, it uses a special 'biological filter'...



Beck and his companies make extensive and elaborate claims for their 'Brain-Tuners'. I enclose photocopies of some: from the USA (BT-5); Germany (BT-6); and New Zealand (BT-9). Given his 'Blood Cleaner' claims for 'medical research in the San Diego area', you might find it enlightening to pursue the University of Wisconsin claim in the BT-5 flyer — and the Food and Drug Administration, for that matter.

I enclose a copy of my letter to the distributors of the NZ unit, who advertise the 'Brain Tuner' on their web site ('Black box drug cure says expert'), and their response. Dr Tom Joll did use one of our NET units in New Zealand, but the article and the claims made on his behalf therein came as a surprise to him.

The BT claims — for the use of the 'OMNI' name 'Brain Tuner' and its inherent association with NET; the use of Neuro-Electric Therapy as a general treatment; of ANY link with Meg Patterson's NET; and for any clinical data on BT efficacy in drug treatments — are superficially convincing, certainly slippery, but verifiably misleading, as I'm sure you will be able to determine for yourself.

Hmmm — thanks for those comments, Mr Patterson. I for one found them very interesting, and I also found your enclosures very helpful. However I must confess they've still left me rather confused about the various kinds of transcranial electrostimulation, all of the subtle differences in detail and their broad similarities. For example to a 'lay' observer like myself, there are at least *some* basic similarities between Patterson's NET and Beck's 'Brain Tuner' — they both use electrodes just behind the ears, and apply a weak pulsed current through the head, for a start. Yet in your own email to the New Zealand distributor/promoter of Beck's unit, criticising claims made on their web site, you seem anxious to separate the two completely:

To link, as does the article, Meg Patterson's treatment and results with the unsupported claims for the BT-series of stimulators, is completely unwarranted. They have NO relevant connection in principle or practice:

I can appreciate that you may wish to stress that there's no commercial, or even professional connection between the two. But in stressing that there's no connection *even in principle*, you seem to be saying that either Beck's device doesn't work, or if it does the principle of operation must be entirely different from that used by Patterson's NET. Which is rather confusing, to say the least...

Anyway, Mr Patterson, thanks again for your response, and I wish you well with your group's efforts to establish a credible scientific foundation for 'subtle energy medicine'. It's certainly needed.

German device

While we're still on the subject of 'subtle energy medicine' (that's a good term, isn't it? I think I'll use it from now on...), the medico friend of mine I quoted back in the May 1998 column has sent me a brochure describing a very fancy looking device of German manufacture, which has apparently been sold to quite a few medical centres here in Australia. It's called the Bicom Regumed, and as you can see from the picture it's designed to be an impressive addition to the doctor's surgery rather than a gizmo for self-treatment by the patient.

The front panel has quite a few controls, including a backlit LCD display, a long LED-array 'frequency dial', a keypad to program in various parameters, and a large rotary knob to adjust the frequency — between 10Hz and 150kHz, in fact. There's also an optional thermal printer and an analog test meter.

But what does this fairly impressive-looking device actually *do*? Well, as far as I can work out from the explanation given in the eight page, full-colour marketing brochure, it's claimed to be able to 'pick up' electromagnetic waves from the patient themselves, process and filter these signals, and then return them back to the patient in a manner which is therapeutic.

The Bicom brochure stresses that the technology 'only uses the patient's own signals'

— in an effort to distinguish it from things like the Rife machine, I suspect.

But how does the Regumed box process and 'filter' these patient-derived signals, to achieve a therapeutic benefit? Ah, that's the interesting bit. Here's how the brochure explains it:

A major advantage offered by this technology is the ability to select from the patient's physiological and pathological signals. This is possible thanks to a specially developed biological filter containing a mixture of substances. The physiological waves enter into resonance with this mixture, allowing them to be separated out from the remaining, pathological signals.

With certain disorders it has proved useful to amplify only the physiological signals while attenuating the pathological portion, or vice-versa.

It seems that when the 'pathological' signals are returned to the patient, they are 'inverted' — presumably so that cancellation occurs. The end result is that:

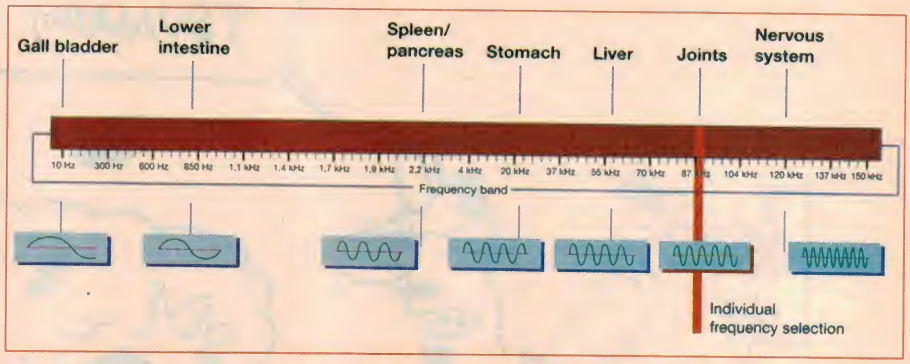
By reducing the number of pathological signals in the organism we are helping to activate the body's self-healing powers.

So the basic principle seems to be that there are lots of electromagnetic signals inside the body, falling into two main groups: 'physiological' (presumably the good guys) and 'pathological' (which seems to imply 'bad guys'). What Bicom's Regumed does, it claims, is separate the two and allow the therapist to process and filter them, before returning selected signals (mainly the good guys, one imagines) to the body. Which sounds like a kind of 'EM signal cleaning' therapy, by analogy with Robert Beck's 'Blood Cleaner', doesn't it?

That filtering...

Needless to say, the Bicom brochure is a bit vague when it comes to the exact mechanism it uses to supposedly separate the naughty 'pathological' signals from the good 'physiological' variety. It's all done by the 'specially developed biological filter containing a mixture of substances', it seems. However from a diagram given in the brochure, signal frequency does seem to play a significant role. As you can see, different segments of the spectrum from 10Hz to 150kHz are labelled as significant for different body systems and functions. Which sounds vaguely like the frequency-ailment theory embodied in Rife-type machines, and even some of Dr Hulda Clark's 'Zapper' gizmos...

Of course Bicom stresses that *their* machine doesn't inject externally generated signals — it supposedly only processes signals already present in the body. (Assuming that really makes much difference.) It's still not clear how they separate the good and bad signals from a particular body area, either.



This Bicom diagram shows the frequencies which they associate with various parts of the body. The Regumed is claimed to be able to separate 'pathological' from 'physiological' signals at these frequencies, for therapeutic purposes...

That mysterious 'specially developed biological filter' must be pretty darn good, don't you think?

It all sounds a bit like a high-tech 'magic chicken', I have to confess. However if anyone can come up with some technically credible, understandable information on how the Bicom Regumed type of device is supposed to work, I'm sure we'll all find it very interesting. I'm grateful to my medico friend for bringing this device to our attention.

EMC & motor homes

Just to end up this month, I have an email from a reader who's responding to Paul Coxwell's item in last October's column, about the wiring of motor homes in Europe and the impact of EMC regulations. The reader concerned is Mr Darrin Wilson, who feels that Mr Coxwell has completely misunderstood why manufacturers have reacted the way they have:

I read with interest Mr Paul Coxwell's comments about EMC directives and motor homes. I feel that Mr Coxwell has completely misunderstood the whole point of the manufacturer's reasons for disconnecting the caravan power when the ignition is turned on.

It is not for the reason, as Mr Coxwell suggests, of stopping devices or appliances interfering with the vehicle's electronic systems — as these would be and are well protected against EMC interference. But rather, to stop engine ignition noise and any other vehicle control systems that generate EMC noise from radiating out to the outside world.

Imagine what we have here: a noise source (engine ignition system) and an antenna (the wiring in the motor home). Now imagine this noise radiator travelling along a suburban street. Every house it passes it creates fuzz on household TVs and static on radios. This would be rather annoying for most people and hence the reason (along with others) for the EMC directives in the first place.

It is obvious that the designers of the motor home ran into difficulties when they submitted the vehicle for EMC testing, in that they were unable to push their emission levels below the limits (bad design?... maybe) and the only easy solution to achieve compliance was to disconnect the caravan wiring while the ignition is on. It is also likely that in motorhomes without the disconnect relay, the designers actually resolved their problems — such that disconnecting the wiring was not necessary.

Being a designer of high frequency switchmode power supplies, I am acutely aware of the problems associated with the suppression of EMC noise and have been through similar situations myself. In future I suggest that Mr Coxwell research his subject matter a bit more thoroughly before he starts making ill-informed comments of topics that he knows very little about.

Thanks for those comments, Mr Wilson. I think you've been rather hard on Mr Coxwell, though, because the 'obvious reason' you've given would surely have been obvious only to designers like yourself, directly involved in meeting EMC directives. While it does make a lot of sense now you've explained it, I think many people not directly involved in design would have made the same assumptions as Mr Coxwell.

Accepting your explanation, though, I guess it also explains why Mr Coxwell and others couldn't get a satisfying explanation from the motor home manufacturers regarding the reasons why some brands and models had a cutoff relay, and others didn't. Those who needed to resort to a relay to prevent their model from becoming a mobile noisemaker would hardly want to admit it, would they?

Anyway, Mr Wilson, thanks for your explanation. I imagine Mr Coxwell and others will agree that it makes a lot more sense than those they'd been given by the motor home manufacturers...

And that's it for this month, folks. I hope you'll join me here again next time. ❖

ATTENTION!

All Electronics and Engineering Professionals

At last you can find concise product and service information on the Internet...

..Search on industry.net - your FREE Online information resource

Researching information on the Internet can be a tedious process of searching through thousands of manufacturer home pages that often leaves you empty-handed.

Industry.net helps you solve this problem by only including product and company information relevant to the industrial manufacturing sector. So a search on industry.net will provide you with precise results - ***fast!***

The service contains product information from over 20,000 manufacturers in both Australia and overseas, and allows you to search by product, company, country, and more.

For more information on how to access this **FREE** information resource, contact IHS Australia today on PH: 1800 062 299, or register today at:

www.industry.net

READER INFO NO.6

OPEN Fist

Treading carefully, sans barge-pole...

by Stewart Fist

I GUESS EA's editor Jim Rowe must be a masochist at heart, because he's suggested I write a column which will occasionally look at the research into possible interactions between electrical/electronic systems and human biology.

In my experience, this is not a subject that those with a technical or engineering bent really like to discuss. Most radio technicians are outright dismissive, in fact. But this is a subject worthy of consideration in Electronics Australia, if only because of the all-pervasive nature of EMFs at mains frequencies, and the sea of radio frequencies in which we are all immersed.

Most editors of technical magazines, however, wouldn't touch the subject with a proverbial 10 foot barge-pole because it is heavily encumbered with the burden of radicalised over-reaction and downright stupidity. But there is always a middle way through these polarised disputes, provided we treat carefully.

We all know that there are good scientific reasons why radio waves should pass through the body without creating problems other than some minor localised heating. We've all been taught that below ultra-violet light in the electromagnetic spectrum, radiation is non-ionising, and therefore should not (by definition) break chemical bonds. It is widely (but incorrectly) assumed by electrical engineers therefore, that such radiation can do no biological harm.

The evidence is that RF signals at levels far too low to cause heating do change biological functions, in dozens of different ways. This has been established so many times that the old argument is unsustainable today. Similarly, confirmed laboratory studies have consistently shown that the fields surrounding mains current can disrupt or change the ways human and animal cells function.

In neither case do any of the researchers claim that these are disruptive or dramatic changes from the viewpoint of humans living our daily lives in a radio-filled environment. Many of the observed changes are subtle and confusing. But these findings *do* challenge the old theories of 'proven safety except when thermal limits are exceeded'.

Such claims, and the exposure standards which depend on them, no longer hold water.

The question now becomes one of establishing whether these exposure effects, in the long- or short-term, can harm humans — especially children during their years of growth. In adults, it is more a matter of calculating whether any potential for harm is justified by the benefits we get from technology.

> ***"It sometimes amuses me to imagine what the world would look like if RF was visible; cellphones would be seen to spray substances like sparklers or smoke pots"***

Nothing we make or use in this society seems to be entirely risk-free — but while you may gain the benefits, I might carry the risk. In such cases, you will understand if I object.

In our modern society, we also appear to apply different rules and criteria to risk-analysis with EMF than we would to more tangible substances, such as drugs, lead in petrol, pesticides, or smog. I suspect that this is just because it is invisible.

It sometimes amuses me to imagine what the world would look like if RF were visible; cellphones would be seen to spray substances like sparklers or smoke pots. Imagine how the public would react if they could see the cellphone radiation entering one ear and exiting like a steam-jet out of the other!

And with the background level of EMF we have today, we'd all be walking around in a bad-day Los Angeles smog. What's more, if the electrical and magnetic fields of mains power wiring were audible, we'd spend our lives shouting to each other above the hum.

This doesn't prove that RF or ELF is dangerous, of course, but I guess what worries me most about our attitude to this research is that we humans have the propensity to assume that the invisible is innocuous. The limit of our concerns often extend no further than our line-of-sight.

I offer as evidence the casual way cotton farmers, orchardists and gardeners often treat the handling of pesticides and herbicides — yet they take extreme care with rabbit traps. Every farmer or gardener I've ever heard discussing the poison hazards of common agricultural chemicals will defend the indefensible with the phrase: "Well, I'm still alive and healthy, so there can't be much of a problem..."

The rebuttal, of course, lies in our independent estimations of the quality of the mental processes which came to this conclusion.

The other problem I perceive is that humans (and I include politicians in this definition) are relatively good at handling critical and short-term problems like air crashes and crypto-bugs in the water supply, but we appear to be unable to grapple with long-term problems in the same logical way. Unless the problem can be solved in a week or a month, and some company can make money out of it, politicians and regulators tend to just stick it on the back-burner and forget about it.

Running parallel with this indolence is a mechanistic tendency to assume that the world is simple, and that there's always a direct cause-and-effect if only you look hard

enough. Engineers and technologists are especially prone to this fallacy, because we spend most of our lives dealing with predictable mechanisms rather than probabilistic relationships.

The idea that environmental pollutants may raise the incidence of serious conditions, yet not be considered to be a 'cause', sounds faintly ridiculous. And the idea that there's little or no difference between a cause and something that just promotes a condition, makes even less sense.

Engineering instincts suggest that we should approach these problems in ways that don't suit biological research. Some researchers assume, for instance, that most people have pre-cancerous cells most of the time, with the immune and cell-regulatory processes keeping them in check. And almost all biomedical researchers now recognise that cancerous conditions usually require an accumulation of external assaults, often from many different sources, accumulated over long periods of time.

If these ideas are correct (and almost all researchers would say they are) then there is no clear distinction between causal and promotion effects, and certainly nothing that can be identified as a cause. Such theories (although they are more substantial than this) could also mean your fate is determined by chance factors involving everything from your choice of parents to what you ate for breakfast, and the time of day in which you happened to use a cellphone.

All of these could come into play, and some of them in a random way. What's more, the most dangerous assaults on a pre-cancerous cell may have happened 20 years ago; with asbestos it often takes 30 to 40 years. We often just don't know.

However while the contribution dice we throw might have only a very low level of probability, we could be throwing them 24 hours a day over an average 72 year lifespan. Some cancers could be the electronic equivalent of the thousand monkeys pounding typewriters, who eventually write *Hamlet*.

Quite obviously the major EMF and RF consequences under suspicion today are not related in any simple linear way to easily identifiable health conditions. Nor would we expect them to be.

Most of the straightforward, cause-effect relationships between environmental pollutants and health have been well established for many years; in fact many were obvious from the start. Most such problems are well researched, and for many, cures are already available. Medicine solves the simple stuff like measles, diphtheria, cholera and smallpox first.

So today the researchers are dealing with the hard stuff, and that involves doing the hard yards, with many reverses of position, counter-intuitive discoveries and mistakes. Hardest of all to research are those conditions which involve the extraordinary complexities of immune system responses; problems of aging, degenerative diseases and growth; and those with the added complexity of genetic determinants.

As always, much of this work is directed at trying to understand cancer-cell proliferation and spread, but the same processes seem also to be involved in senility and aging problems. All depend on understanding the fundamental mechanisms of molecular biology.

And, at this molecular level, the human body is better understood as an electrical system than as a chemical one. The voltage gradient across a cell, for instance, is about 100,000 volts/cm, and it is this voltage (only 0.1 volts in fact, because the cell membrane is so thin) that keeps the cell stable and viable.

The body also exhibits transient chemical reactions within the cell, which are best considered as random noise. Despite the health-food-faddist association of the term 'free-radical', the problems created within cells by these oxygen-rich molecules are under intense investigation, right across the biomedical spectrum. It's known that both magnetic and electrical fields effect their behaviour, and that substances like melatonin and vitamin E moderate it.

Free-radicals are highly reactive. They only exist for nano-seconds, but their effect can still be profound in terms of cancer production and cell aging. Radical pairs seem to exist in either singlet (reactive) or triplet (diffusive) states, depending on whether their unpaired spins happen to be antiparallel or parallel to the surrounding field.

So in recent years, many researchers have shifted emphasis to this new field of 'spin chemistry', which involves influencing chemical reactions between radicals by magnetic fields and microwaves. This is expensive research, involving experimental tools for electron spin and nuclear magnetic resonance. In fact there appears to be so many radical forms of resonance being postulated, most at dimensions well below cellphone wavelengths, that it makes my mind spin in harmony.

At a higher level, the cells in the body communicate with each other along pathways which could well be considered electrical circuits. The messengers which traverse these pathways are often hormonal in nature, and often ionised. Cell duplication and self-destruction (apoptosis) is not a random process, but appears to involve cell-group decisions conveyed by special enzymes which require electrical 'security cards' to enter the cell via the membrane's ion-channel.

Signal transduction pathways exist between the cell membrane and the nucleus where the DNA resides, so this is an important issue for genetic modification and in the process of cell-duplication, and these dimensions are much closer to those required in classical resonance theory. ❖

Serviceman

"When I turn on the air conditioner, the headlights go off!"

One of our stories this month concerns a somewhat reluctant repair to an electronics module in a small 4WD vehicle, which suddenly developed strange symptoms. The cause of the trouble turned out to be surprisingly familiar — although tracking it down wasn't helped by the fact that the manufacturer had hidden everything under a layer of paint...

WE'LL OPEN this month's column with a topic that raises hackles whenever it's mentioned — automotive electronics. Or more particularly, the cost of *replacing* auto electronics modules, since the industry seems to be dead set against 'repairing' auto electronics...

The story comes from Barry Hubble, of Moulden in the Northern Territory. Barry's story is essentially a simple one of finding a faulty component and replacing it. The interest lies in what it was, and the odd symptoms it produced. Here's what Barry has to say...

One Sunday afternoon an acquaintance came calling, complete with a carton of my favourite beer under his arm. While it was unusual for him to be paying me a social call, I looked forward to spending a quiet afternoon chatting and having a few social drinks. After a short while however, it transpired that he really wanted me to look at a problem he was having with his motor vehicle.

He drives an older small (toy) 4WD, and the problem was with the air-conditioning system. Since I was an electronics technician, I should be able to fix it for him. Would I?

I pointed out that I had no knowledge of vehicle air-conditioning systems, I had no desire to expand on my knowledge in this field, and I certainly wasn't wasting a Sunday afternoon looking at something that should be referred to a person more qualified in that area.

However, as the afternoon progressed he kept steering the conversation back to his problem (he is a very persuasive talker, and the contents of his carton helped a lot) and I eventually had the full story. The air-conditioner worked fine as far as delivering cold air, but when it was in operation many of the vehicle's other functions didn't work. This included erratic operation of the turn signals, brake lights and headlights. It was this latter symptom that had alerted him to the problem.

He had turned the air-conditioner on whilst driving at night, and was plunged into darkness. He had taken the vehicle to be repaired and they had identified the problem as being in the 'control module' mounted under the dash — but it would take a week to get a new one in. Moreover, it would cost over $500 to have a new one fitted.

My curiosity was aroused, but I said there was no way I would spend a lot of fruitless time under his dashboard looking at what would obviously be a processor based 'module'.

I swear I didn't see him move, but suddenly he had the 'control module' in his hand. He said they were pretty easy to remove, since he had observed the operation when they had removed one from a second-hand vehicle to substitute for his.

Removing the cover of the module revealed no microprocessor, but a printed circuit board fitted with what appeared to be transistors, diodes and passive components — without an integrated circuit in sight.

The top of the board had been painted to obliterate all component markings, but a bonus was that most of the circuitry appeared to consist of two identical channels, much the same as a stereo amplifier.

I hooked the meter up to a common point and it wasn't long before a resistance check on the copper track side revealed a discrepancy between the two channels. Further probing suggested that a transistor-like component was the problem and the devices from both channels were unsoldered and labelled so there would be no mix up.

I didn't know which side of the board (if either) was faulty, nor exactly what the component was. I tried chipping the paint off and this was a success in that it came off easily enough. But there was no part number on either device anyway.

One device tested OK as a PNP transistor, but with low gain and some leakage, reminiscent of an old germanium transistor. The other one didn't seem to be anything specific; there were no shorts but I got reasonably low readings in all directions.

Since the tests were inconclusive I decided to work on the assumption that they were PNP transistors, that one had died, and that the other was decidedly ill as well.

I replaced both with BC327s and hoped they didn't have to handle more than 500 milliamps. The different pin configuration was a problem too, but this being a Sunday, with no chance of obtaining an alternative, I had to use what was to hand.

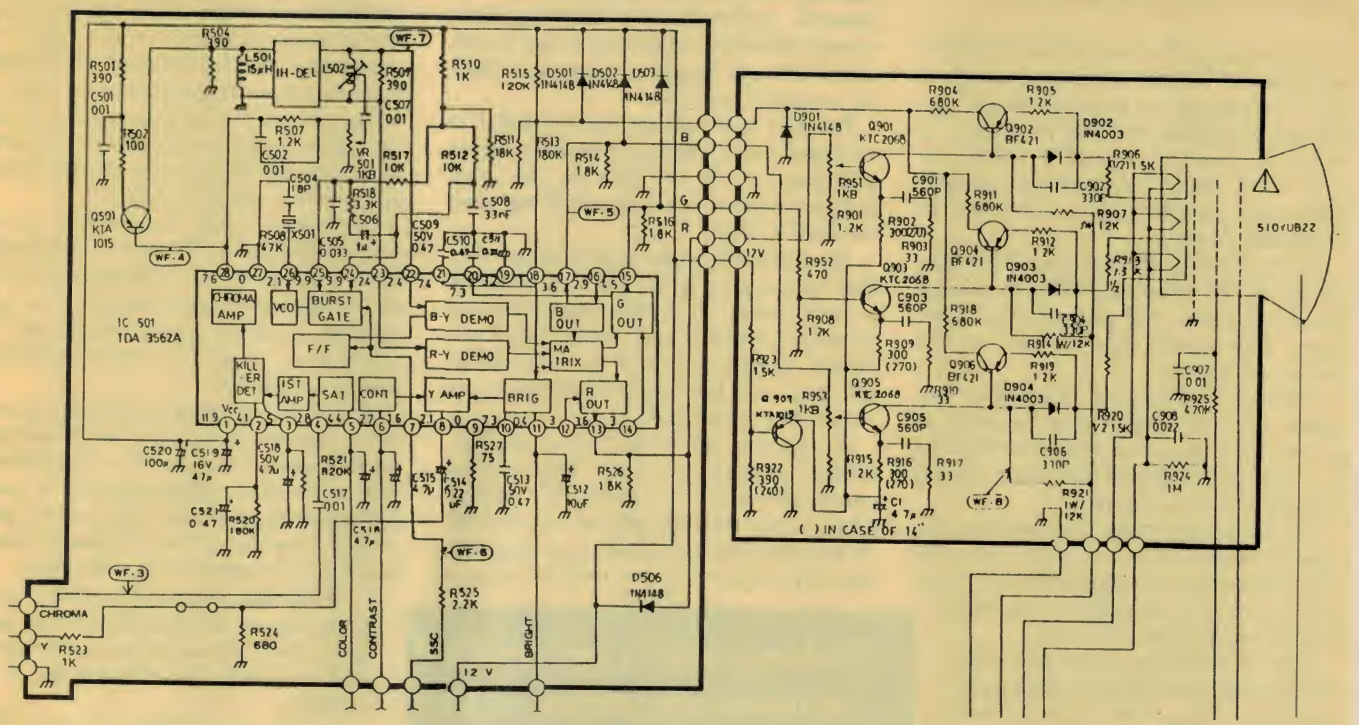
With some apprehension we installed the module, crossed our fingers, and started up. Everything worked fine, and soon the owner motored off into the distance. However, I still don't know what it was I repaired nor why it would cost so much to replace.

Barry, I'll let you into a secret: neither does anyone else outside the motor manufacturer's inner circle! I believe it's quite unfair that they should be allowed to charge so much, for what amounts to a handful of small components worth only a few dollars at most.

Another unfair action is to obliterate the part numbers on every component. The only reason would seem to be preventing repair, so that they will sell more new ones at $500 each!

I'm afraid I have no time for the spare parts policies of present day motor manufacturers. Just imagine the clamour if TV and video manufacturers adopted the same policy — a whole new board every time a transistor failed! There'd be a riot.

Anyway, thanks for that story Barry. It might encourage others to look carefully before they discard an otherwise repairable PCB.



The video processing and output circuitry of a Goldstar 20" CTV, model CBT 9328. The output circuitry is on a small PCB attached to the tube socket; that on the left is on a small daughter PCB.

Labour of love?

NOW WE COME to a contribution from Graham Smith, of Lindfield in New South Wales. Graham doesn't state that his story relates to an exercise in resurrecting Junque, though I suspect that this might be the case.

Then again, it may be a job that came in over the counter. But either way, it provides an interesting story about restoring a TV that may well have ended up on the junk pile. Here's what Graham has to say...

In the beginning, there was this 20" Goldstar, model CBT 9328. At turn-on, the EHT crackled up nicely and on tuning a channel there was sound; but only a black screen.

The voltages on the tube baseboard looked OK, but there was no cathode drive signal. This is developed on a small daughter board, where input video information was present. The main work on that board is implemented by a 28-pin TDA3562A which became the principal suspect. Without urgency or a replacement part on hand, that chassis was stood aside, until...

Some weeks later, a friend happened across a discarded set with a similar chassis. It turned out to be a Palsonic 4824 and conveniently, it had a similar daughter board — which restored picture when used in the first chassis. So there's no more to say about that one.

So what could be said of the second set, the Palsonic? Crikey! Someone had given it a severe workover. The neckboard was decorated with some components on the copper side, many components with one leg raised, also many replacement components with uncut legs.

There was also evidence of the line output transformer having been replaced.

Additionally, it was rats-nest grubby, which I find makes post-mortem efforts unnecessarily taxing. It's no fun when trying to read values, while worrying whether a particular board stain is wax, or adhesive, or produced by heat, vermin, electrolyte, or just a spilt drink.

Now, many might cringe at the next process, but it's a technique I've used quite often and have yet to see any deleterious impact.

For the purpose of dust and grime removal, I've found that a scrub up with a weak detergent solution and paint brush far more effective than mere dry brushing. This of course is conducted out of doors, since a fine spray from the garden hose is needed to rinse off all the detergent and dirt.

Of course, saturation of transformers, IF cages or tuners is contrary to intent; only the main surfaces are targeted. This treatment can also be applied to timber cabinets but whatever the subject, a bright sunny day and an early start are pre-requisites to bake dry everything quickly and thoroughly.

If there's any lingering doubt, an overnight blast from a fan will finish that procedure. Controversial? Maybe, but it works for me.

Now would this chassis be worth more than scrap? By placing it adjacent to the operational Goldstar, the tube and yoke were substituted and found functional, so that was a good start.

The main board didn't appear to be butchered, so I turned next to the neck board. I can't imagine what the previous hack was chasing. Why were all the ceramic caps, diodes and some resistors standing on only one leg? That seemed unnaturally desperate.

Serviceman

The diodes and resistors were checked, caps ignored, but all restored to a sure footing. Now plainly, the previous worker was chasing something and with the degree of butchery evident, I wanted to check the entire neck board component by component, rather than feed it power and risk the smoke and flames.

This paid off, with the finding of a solder bridge on one of the small NPN transistors ahead of a power PNP cathode driver transistor. This would have turned on that colour really hard.

Also C1, a 4.7uF/25V electrolytic was found inserted with wrong polarity! It relates to a luminance feedback network. So I wonder how effective the beam current limiting is for this chassis?

The neckboard from the Goldstar had significant departures in layout and also slight differences in components, so it wasn't quite as easy as blindly comparing measurements between the two.

Now in preparing to use this neckboard in the good Goldstar, I had a new realisation: the screen wire had been soldered directly to the board, when it surely should have been a pin and socket connection. And the insulation cover clips on the focus connection cover had been snapped by force.

The screen connection was improvised from scrap, but the focus attachment would later need a dab of adhesive to stop it hissing. Happily the neckboard was found to work when substituted into the Goldstar.

I would have liked to get some confirmation that the front panel and tuner of the butchered chassis were working before proceeding further, but that was not practical since the two chassis had quite different assemblies — the Goldstar with electronic tuning on a separate board; the Palsonic with pot-set tuning, with the tuner on the main board.

A review of candidate hotspots on the Palsonic main board suggested the horizontal output transistor was OK, power supply chopper transistor shorted and a 4.7-ohm 5W resistor in line with the mains input, open.

Curiously that resistor was piggybacking another (original?) five watt resistor, also open. So evidently someone's attempted repair in this section was rewarded in dramatic style.

The power supply section is quite small, so a quick once-over of all resistors, capacitors and diodes was achievable. Sometimes wayward electrolytics can cause trouble, but these checked OK.

R808, a 1/2W 330k supplying power to the regulator IC, measured 465k but with no strong sign of heat stress. Actually, without the Goldstar on hand for comparison I'd have incorrectly replaced it with 220k, at first reading red instead of orange!

Now I turned my attention to the power transistor, a BU508DF. I still didn't have a plausible explanation for it having been cooked. Resolving tentatively to test briefly with a 50V AC supply, I rummaged about for a suitable transistor.

The data book told me that BU508DF is insulated, with a built-in diode. But hang on a minute — the BU508A in the good Goldstar chassis is not insulated and does not have a diode!

Ah... did some bright spark perhaps think that the presence of the extra diode would provide greater protection against flyback energy? I suspect more likely, there was limited exertion of mental prowess and an ad hoc, ill-considered substitution for momentary convenience.

In practice the board has a separate damper network of a cap, diode and a wattwaster rated at five watts. Another idea: maybe the original was removed for testing and replaced without an insulator; then after the error was realised (after a loud bang), perhaps an (inappropriate) insulated device was inserted?

"Probing around, I was surprised by seeing a full picture — but I hadn't changed anything yet!"

I suspect with all that extra energy dumped into the transistor case, rather than the 5W resistor, its life would have been severely truncated. The BU508DF rating of 34W versus 125W for BU508A didn't help, of course.

With no other obvious avenue to explore passively, a burst of 50V power was applied. There was no smoke, just a starting click from the power supply. Now with a few seconds of 50V there was a sequence of starting clicks, which was identical to the Goldstar on a 50V supply, and nothing burned up.

At 110V, the result was also positive. At 240V the reassuring EHT crackle was heard. Although tube baseboard voltages seemed good, the screen remained blank. This started to resemble the problem with the Goldstar!

Now the scope was pulled into action to look for cathode drive, and a funny thing happened. While probing around I was surprised upon seeing a full picture in the mirror. But I hadn't changed anything yet!

It turned out that the normal ground connection was the shield of a 12V supply cable, and this had become broken at the board join. When I had attached the scope earth clip on the neck board, this completed the circuit through the scope chassis, mains earth and the chassis earth connection.

Yes, I was using non isolated power and by chance, the TV was fitted with a mains earth — not very common in these days of double insulated appliances.

After all that comedy I remain unsure what the original problem was. Why was the LOPT replaced? Why was the focus wire of marginal length? I was briefly concerned that the replacement transformer might have been designed for a 14" tube.

Then, at what point in proceedings was the solder bridge on the neckboard introduced, and did that have the effect of taking out the power supply or LOPT?

Why were so many components on the neckboard replaced? Was there some major burn caused by the solder bridge? Why had the incoming mains cable been severed and rejoined, carelessly insulated with a turn of electrician's tape? So many questions remain unresolved.

Maybe the hack simply dropped a screwdriver somewhere unfortunate? It seems to me that through incompetence or carelessness, a simple problem escalated in many different directions with 'that person' then unable to fathom all the introduced manifestations. I'm afraid we'll never know.

Well, there we are! See what I mean about the set being headed for the junk pile. That Palsonic sounds as though it had just about passed the point of no return.

As you say, Graham, it seems that hacker had tried everything and solved nothing. I think most of us have come across that kind of butchery from time to time, but probably not as bad as it seems you found this time.

As for your 'Wet Cleaning' method Graham, I've used the same procedure myself several times, with complete success. I have also heard of a Philips K9 being recovered after being totally immersed in a major flood. (In that case the speaker was the only component that had to be replaced!) There is a risk in the process, but it's one well worth taking.

One other point. You mentioned C1 on the tube base board being inserted the wrong way round. This often happens and appears to cause little or no trouble. It seems that small, low voltage electros can change polarity, apparently without serious damage.

I remember doing a story in this column once about a set with the silk-screened overlay showing all electros wrong way round. The caps had been inserted correctly at the factory, but when replaced during service, had been put in wrong way around.

The big caps failed almost immediately, but the small items survived, and ultimately reversed their polarity. As far as I know, they are still working perfectly. So C1 may not have caused much trouble at all.

Thanks for your story Graham, and I hope that we'll have some more stories from you, in the future.

And that's it for this month. I've got one of my own stories for next month, and further contributions from our readers. Keep watching! ❖

We have a big range of everything, especially stores.

What have we got? Just about anything you could ask for. From Caller ID and cordless phones to mobiles, pre-paid Sims and Top-Up cards. Faxes to outdoor and indoor TV antennas. Computers, printers, zip drives and modems. Walkmans, portable CD players to the new mini disc walkman. Keyboards to karaoke systems. Power-surge filters to personal security. Watches to walkie-talkies. It's all at your nearest Tandy Electronics store. We have all the accessories you'll ever need to make your bits work better. With over 350 stores and dealers nationally.

You've got questions. We've got answers.SM

Don't delay call 1800 506 605 we have the answers

Tandy ELECTRONICS

ZULU.TA205.E

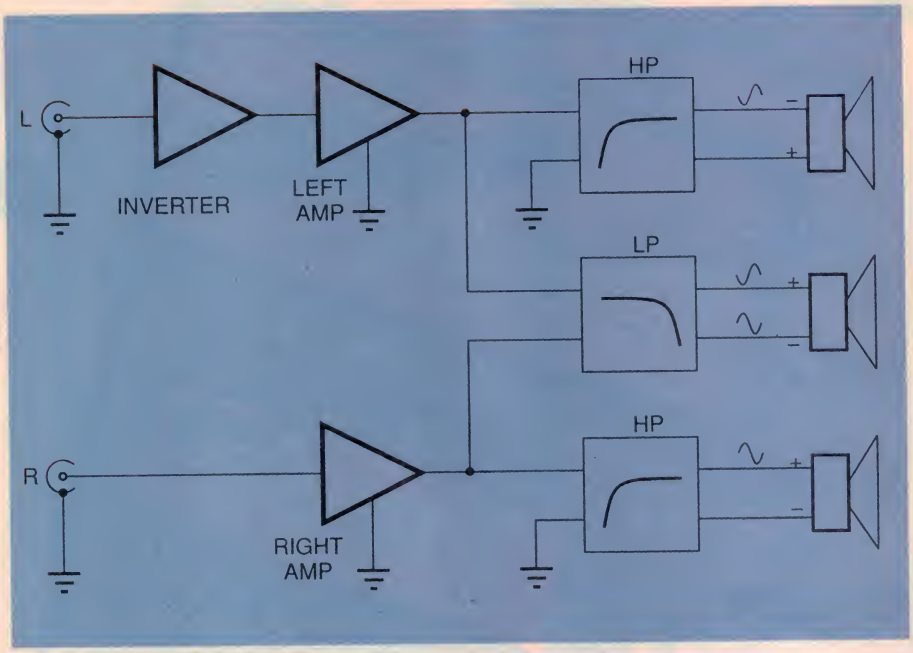
READER INFO NO.11

Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

'PhaseBridge' gives free third channel

THIS MONTH'S WINNER!



Considerable savings of money, space and complexity are possible by using the little known 'phantom' method of deriving a centre/mono L+R channel from the side channel power amplifier outputs of s stereo system.

Applications of the system include the addition of a subwoofer to an existing system (home or car), or to construct an excellent yet very economical system where the side channels reproduce only the mid and high ranges, and a central or 'common' woofer handles frequencies below 400-500Hz (depending on how low the midrange drivers go).

The loss in stereo impact is negligible, because most stereo information resides in the middle and high ranges. As the woofer is driven by both amplifiers, its power for in-phase signals is increased by 3dB. This small bass boost can be eliminated by a left-right pair of simple R-C step networks ahead of the power amplifier.

The block diagram shows the system driving an additional woofer. While with some drivers second order (12dB/octave) filtering may be advantageous, the first order (6dB/octave) filtering shown in the diagram usually does the job nicely and cheaply. Importantly, the crossover frequency should be at least one octave above the midrange driver's resonance.

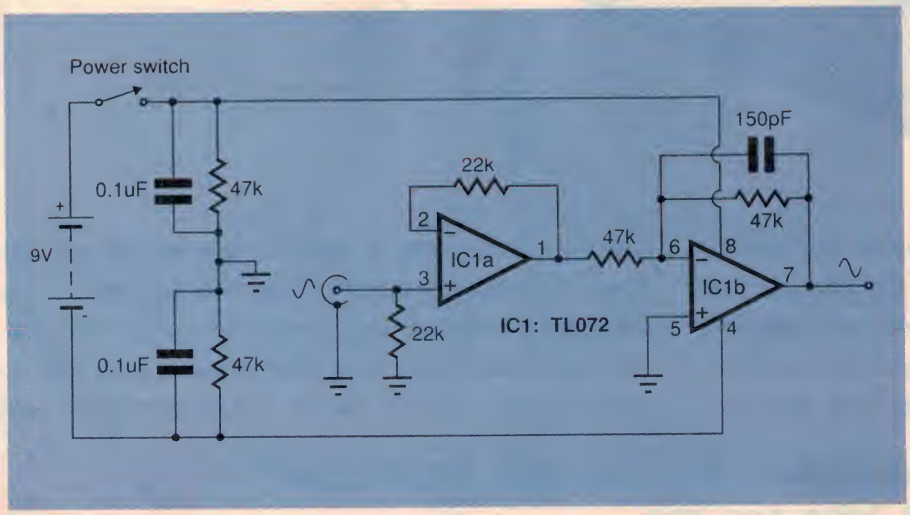
Apart from the filter (not required if the system is used to drive a 'home theatre' centre channel) the input to one of the power amplifiers needs to be phase-inverted to allow bridging the centre channel between the side amplifiers, as shown in Fig.1. The correct phase of the inverted channel is restored by reversing the connections to the corresponding side speaker.

A typical unity gain inverter is shown in Fig.2, and if the power amplifier is fed from a low impedance source (e.g. the output of an op-amp), a TL071 will do the job. Otherwise, a TL072 should be used, with one half acting as as a unity gain non-inverting buffer. A 9V battery supply can be used if the main power on/off switch has spare contacts, and the battery life will be approximately 300 hours with a TL071 or 150 hours if you use the TL072.

I will conclude with two reminders, likely to be obvious to most readers. First, the system cannot produce additional bass power; all it does is to route some (as in case of subwoofers) or all (as with the common woofer configuration) of the bass from the side channels to the centre. The advantage comes from being able to use just one, better, possibly more efficient loudspeaker in the range usually most expensive to reproduce.

Second, if the system is employed to derive a full range (i.e. unfiltered) centre channel, the existing amplifiers will be doubly loaded. If they can work into a nominal 4-ohm load (as most amplifiers now can), there is no problem. If you are not sure and cannot find out, err on the safe side and use a 16-ohm centre speaker; coincidentally this also obviates the need for the 3dB cut network mentioned above.

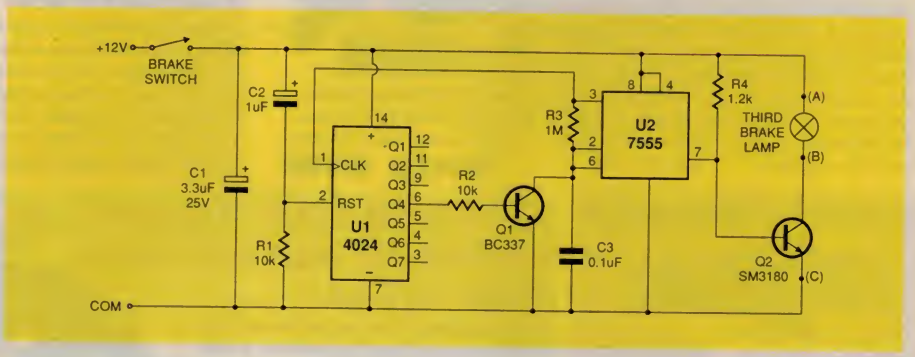
Peter Gonda
Linden Park, SA **$40**



As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is an open order to the value of $300 from Oatley Electronics! Yes, that's $300 to spend on anything you want from Oatley's wide range of products, so check out their ad (or their Website) to see what's on offer.

Win our 'IDEA OF THE MONTH' Prize!

Third brake light for cars



In the August 1997 issue of EA, KRL of Toowoomba, Qld offered a circuit for 'Flashing' the third brake light commonly fitted on most modern cars (and retro-fitted on quite a few older cars, including mine).

My circuit requires an extra electro (across the input, the big advantage of KRL's circuit being that it is apparently tolerant of noisy brake switches), but saves on the diodes.

The operation is slightly different. In my case, I had on hand a power transistor with sufficient Hfe to avoid a Darlington. (Designing it today, I would go for a FET, driven directly from pin 3.) Now the Hfe for this transistor can be as low as 150 and since the third brake light draws almost 1.5A at 13.8 Volts, I needed a base current of about 10mA.

The conventional configuration would drive the transistor from pin 3 of 7555, but the base current was pulling pin 3 down several volts. I thought this was asking rather too much of the chip, so adopted the less usual configuration you see here. The advantage is that since pin 7 is an open collector pull-down, I could take the base drive directly from the supply line and avoid any internal drop in the 7555.

Pin 3 still clocks the 4024 and the counter stops the oscillation via Q1 pulling down pin 2 after eight pulses, when pins 3 and 7 remain high. There is flexibility in the choice of the number of flashes you wish to display before holding. Also, I felt the need for a somewhat faster flash rate than KRL (three times in fact; 6Hz) to convey a sense of urgency.

The whole thing can be put together on a 25 x 50mm piece of Veroboard, wrapped in insulation tape and fitted wherever convenient. I used no heatsinking for Q2.

Table 1 gives a short list of installation options, depending on whether the 3BL (third brake light) is to be a modification or a retro fit.

Brian Critchley
Elanora, NSW **$30**

Table 1

3BL and control module in one retro-fit package, plus existing brake switch (only two connections to be made).

Brake switch in high side:
- Connect point (C) to common
- Connect point (A) to brake switch, load side

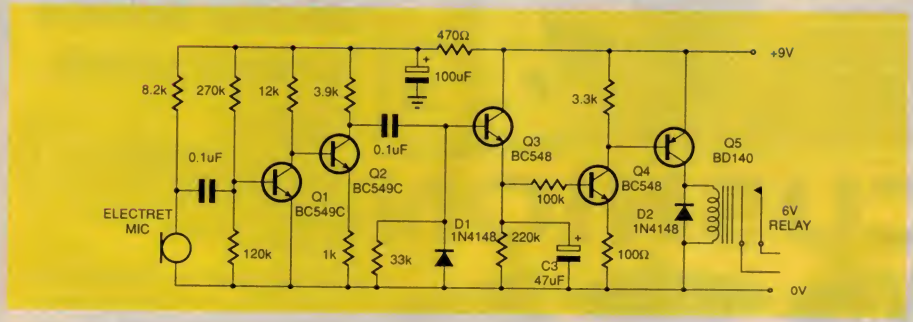
Brake switch in low side:
- Connect point (A) to +12V
- Connect point (C) to brake switch, high side

Existing 3BL and brake switch to be wired to a retrofit control module:

Brake switch in high side:
- Break 3BL connection to common and instead connect to point (B)
- Move 3BL connection from brake switch load side to point (A)
- Connect point (C) to common
- Connect point (A) to brake switch, load side

Brake switch in low side:
- Break 3BL connection to brake switch and instead connect to point (B)
- Connect point (A) to +12V
- Connect point (C) to brake switch high side

Sound operated relay



Really, the name says it all. Relay RLY1 pulls in whenever the microphone picks up a reasonably loud noise, and will remain energised for a few seconds before opening again. The relay's activation period can be increased or decreased simply by changing the value of the 47uF capacitor (C3) from 4.7uF up to 470uF.

Q1 and Q2 form a small amplifier, and the resulting signal is rectified by D1, and passed to the switching stage comprising Q3, Q4 and Q5. If the amplified signal from the microphone is sufficient to turn on Q3, C3 charges and keeps Q4 and Q5 on for a short period of time. The 220k resistor ensures that the capacitor will fully discharge, and that Q4 will eventually turn off. Q5 can be any switching transistor capable of handling the relay coil current.

Pradeep G.
Alappuzha, South India **$30** ❖

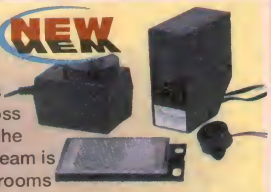
Jaycar ELECTRONICS

JANUARY 99 SALE

Prices valid until End January 98

REFLECTOR SECURITY BEAM

NEW MEM



This security beam uses infra red (IR) which is transmitted to a reflector and back again across a doorway. If the beam is broken by anyone, the buzzer will sound, and only sound while the beam is broken. It is ideal for shops, offices and storerooms etc. to warn of a visitor. The buzzer is on the end of 20 metres of cable, which can be run out the back to the office. The range is up to 7 metres. The transmitter plugs into the mains power, through a plug pack adaptor, which is supplied. Cat. LA-5192

Only $119

SECURITY BEAM WITH TRANSMITTER AND RECEIVER

NEW MEM

This security beam is similar to the reflector type LA-5192, the difference being it has a receiver unit instead of the reflector. The receiver unit allows the effective range to be as much as 20 metres. This makes this unit suitable for warehouses with large doorways etc. Supplied ready to go with 20m of cable connecting the transmitter & receiver, & 20m of cable for the buzzer. Mains plug pack supplied. Cat. LA-5194 **Only $139**

LASER MODULE

Ideal for experimentors. Includes laser diode mounted on a PCB with a battery spring and on/off switch. Simply connect a 3V battery - negative to spring, positive to case, and you have an experimentors laser. 1mw output. Cat. ST-3115 **$14.95**

NEW MEM

IS YOUR CAR ALARM REMOTE NOT WORKING TOO WELL?

NEW MEM

Problem solved! This key fob transmitter will learn the code of your transmitter. Brand name replacements are very expensive, and sometimes impossible to get. This will solve your problem. It can actually learn up to 4 different frequencies, so it can be programmed for the car alarm, the garage door, home alarm etc, etc. Supplied with full instructions. Cat. LA-8990 **Only $39.95**

PIR CCD CAMERA

NEW MEM

This is a motion activated camera. When the PIR detects someone, the CCD camera is switched on, and the following can be triggered: •Alarm output. Terminals are NC, NO and common. 30VDC / 0.5A rated. Use this for triggering an alarm control panel, light, VCR or monitor etc. •Light control output. This NC output will switch a mains lamp up to 500W / 2.5A. There is a DIP switch, will allow you to charge the following: •Turn on time 3, 20 or 60 seconds •Audio output (includes on board high sensitivity microphone) either on or auto •Video output on or auto •LED walk test for PIR •PIR pulse count - 1 or 3. Also includes a tamper switch output leads for video - BNC, 12V power input skt and mounting bracket. PIR detection range - 110° at 12 metres. Not suitable for outdoors. Size 125(H) x 68(W) x 42(D)mm. Cat. QC-3478

Only $199

DUMMY DOME SECURITY CAMERA

NEW MEM

This dummy dome camera looks exactly like the real thing, at a fraction of the price. Make your business/home/office look like its under surveillance. (Even includes the metal camera case inside). Cat. LA-5315

Only $39.95

REAL DOME CAMERA

Cat. QC-3472 **$139**

Military Gas Torch

NEW MEM

This Pocke Torch lighter runs on butane gas. The case is clear and it has a piezo start. The flame is adjustable and can be locked off or on. Supplied with a cap on a chain. Height with cap is 76mm.

Cat. TS-1684 **Only $29.95**

MOBILE BABY MINDER

NEW MEM

$69.95

The transmitter (in the baby's room) plugs into the mains power and transmits to the receiver which is mobile. So you can take it with you outside & still monitor the baby. Cat. AI-5540

LASER LEVEL

NEW MEM

This laser pointer level will allow you to check levels and lines in a radius of up to 10 metres. Comes in a aluminium case with a spirit level, screw thread for tripod mounting and 2 magnets to attach to steel structures for use on various angles. Ideal when levels are required for bricklaying, pipelaying, setting windows etc., etc. Size 145(L) x 34(H) x 18(W)mm. Supplied in carry pouch.

Cat. ST-3110 **$139**

AURA INTERACTOR CUSHION

FEEL THE ACTION

Only $79.95

LESS THAN 1/2 PRICE

HUGE SURPLUS STOCK PURCHASE

We have made a huge distress stock purchase from AURA in USA. We have sold thousands of the Interactor Backpacks,and now can offer a CUSHION VERSION, for a crazy low price. The cushion should sell for well over $200, but you can grab one - or more, for only $79.95 each, while stock lasts. **THEY ARE UNDER 1/2 PRICE!** This Interactor Cushion will transform low sounds into movement, so you can actually feel these through your back. Simply place in your lounge chair, or seat, and complete a 3D sound environment for added impact for home theatre, computer games etc. The Interactor Cushion can be used with almost any PC/Mac, home theatre system, CD player or video. Supplied with black cushion (with inbuilt shaker), amplifier module, 240V mains power supply and connecting lead set.

Cat. XC-1005

BUY10 LESS 10%

www.jaycar.com.au

SMALL SPEAKER DEALS

No. 1
4" (100MM) ROUND SPEAKER
4Ω 2 WATT.
Cat. AS-3009

NEW MEM

Only $2
Buy 10 $1.60ea

No. 2
5" (125MM) WITH SET BACK MOUNTING BRACKET
6 WATT 4Ω. Cat. AS-3011

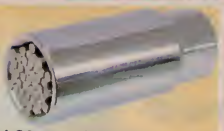
NEW MEM

Normally $6.75
Only $3.50
Buy 10 $3.00ea.

EMAIL ORDERS

mailorders@ jaycar.com.au
EMAIL YOUR ORDERS NOW

MAJIC SOCKET



SELF ADJUSTABLE 3/8" SQUARE DRIVE SOCKET.
Will adjust to nuts around 20mm diameter.
Cat. TH-1908 **Was $16.95**
Jan. $10 Save $6.95

51 PCE. RATCHET SCREWDRIVER SOCKET SET

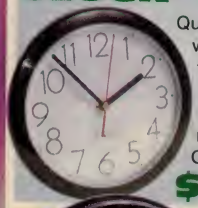
See 98 Cat. page 116.
Cat. TD-2002
Was $36.95
Jan. $28.95
Save $8

LOW COST INSULATED SCREWDRIVER SET

See 98 Cat. page 117.
Cat. TD-2008
Was $18.95
Jan. $12.95 Save $6

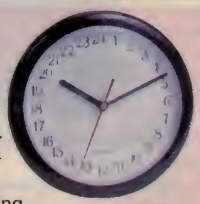
8" WALL CLOCK

NEW MEM



Quartz timing with white face (Dia. 20cm) and black numbering.
Cat. XC-0110
$12.95

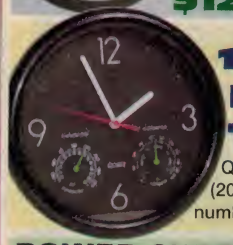
8" 24 HOUR WALL CLOCK



Great for shift workers! Quartz timing with white face (Dia. 20cm) and black numbering.
Cat. XC-0111 **$19.95**

NEW MEM

10" CLOCK WITH HUMIDITY & TEMPERATURE



Quartz timing with black face (20cm dia.)and white numbering. Cat. XC-0112 **$19.95**

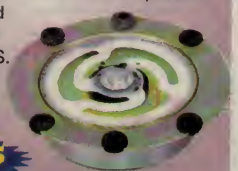
POWER SUPPLY BARGAIN Cat. MP-3055

Not only have we done a huge surplus stock purchase of the Aura Cushions and Shaker Motors, but we also have thousands of the very versatile 2 x 11.5VAC @ 1.25A power supplies. This is ideal for a ±12V 1.25A power supply. A bargain at only $19.95

$19.95

AURA SHAKER MOTOR ASSEMBLY Cat. XC-1008

An experimenters delight. These units are very similar to those fitted in some really up-market movie theatres.Specifications for the Subsonic Actuator: •Operating Frequency: Subsonic, Max force: 20 foot pounds, Nominal Force: 0.5 foot pounds per watt •Rated power: 18 watts continuous RMS. •250(W) x 300(H)mm •Weight: 1.5kgs



$24.95

800MAH AA NICAD SELLOUT

TYPE	CAT	SAVE	WAS	NOW
NIPPLE	SB-2450	$1	$3.50	$2.50
SOLDER	SB-2451	$1	$3.75	$2.75

Limited Quantities Available

BUY 10 LESS 10%

OVERNIGHT DELIVERY

"FLIGHT CASE" STYLE TOOL BAG

See 98 Cat. page 109 for full details.
Cat. HB-6372
1997 Price $89.95
1996 Price $69.95

Save $40!
Jan. Sellout Price $49.95

RJ45 TO RJ45 LEAD

Modular lead with 8P8C RJ45 plug on each end.
Length 2 metres. Approved.
Cat. YT-6084 **$6.95**

NEW MEM

RACK BOX SELLOUT

132mm rack case without front panel. See 98 Cat. page 107. 110 only
Cat. HB-5428
Was $72
Now $35!!

BLACK PANEL to suit Cat. HB-5434
Was $24.50
Now $14.50

SILVER PANEL.
Not available at dealers.
Cat. HB-5435 **$14.50**

BABANI BOOKS

AN INTRODUCTION TO PIC MICROCONTROLLERS

This book helps to dispel some of the more daunting tasks associated with PIC programming. Some of the topics covered include the PIC register set, clock circuits, subroutines & driving 7-segment displays. PIC processors have plenty of useful features and with the help of this book, are reasonably simple & straightforward to use. 166 Pages. 111 x 178mm. Cat. BB-7056 **$19.95**

SIMPLE SENSOR TERMINAL BLOCK PROJECTS Cat. BB-7057	$15.95
MS-EXCEL 97 EXPLAINED Cat. BB-7442	$21.95
TROUBLE-SHOOTING YOUR PC Cat. BB-7441	$21.95
CREATING WEB PAGES USING MICROSOFT OFFICE 97 Cat. BB-7444	$21.95
MS-WORD 97 EXPLAINED Cat. BB-7440	$21.95
EXPLAINING MICROSOFT MONEY 97 Cat. BB-7443	$19.95

SPEAKER TOP HAT ADAPTOR

We've had a shipment arrive, and they are not as good as what is pictured in the catalogue. They will work fine (up to 45Kgs), but they don't look too wonderful. Grab some at this crazy price. Cat. HS-8035
Normal Ones are $13.95 **HALF PRICE!!**
These are Only $6.95

4 SECTOR WIRELESS ALARM SYSTEM

Install it over the holidays! It's easy and if you buy now, its cheaper!! Cat. LA-5490
Normally $329.50 **January $269.50** **Save $60**

HEADSET TELEPHONE

NEW MEM

Talk on a phone line and have both hands free to work. This is a stand alone headset telephone, not a handsfree adaptor. Features last number redial, dual tone electronic ringer, mute button and receiver volume control. (Not suitable for Commander system) Cat. YT-7060
$69.95

www.jaycar.com.au

OVERNIGHT DELIVERY

HALOGEN LAMPS CRAZY PRICES

MR16 HALOGEN LAMPS Normally $5.50ea with a glass cover, these do not have the cover. Pay up to $8 in the lighting shop for these. Limited quantity available. Be quick. Three types available.

1) **Large 51mm 12V 20 Watt 38°** Cat. SL-2790
2) **Large 51mm 12V 50 Watt 38°** Cat. SL-2792
3) **Small 35mm 12V 20 Watt 38°** Cat. SL-2793

Only $3.95ea

PROFESSIONAL GRADE GARDEN LIGHTING

Large range of fittings and a choice of low-voltage lamps. All fittings are black in colour, made from die-cast high-grade material, and (unless noted) accept MR16 globes (not supplied).

HIGHLIGHTER Cat. SL-2772 **$29.95**

BURIAL TYPE Cat. SL-2776 **$29.95**

FLOOD Cat. SL-2770 **$29.95**

STEP Cat. SL-2778 **$19.95**

PAGODA Cat. SL-2782 **$39.95**

PATH Cat. SL-2780 **$29.95**

NEW MEM

BRACKET & SPIKE Cat. SL-2774 **$29.95**

BC GLOBES Size 300(H) excluding spike, dia. 140mm.
12V 15W Cat. SL-2721 $0.95
24V 20W Cat. SL-2719 $0.95
JC pin globes.
12V 20W Cat. SL-2722 $2.95
24V 35W Cat. SL-2723 $4.95

TOROIDAL TRANSFORMERS
To power your lights from mains power we suggest one of these in an enclosure:
150W (for 12V) Cat. MT-2112 **$56.95**
300W (for 12V) Cat. MT-2130 **$74.95**
160W (for 24V) Cat. MT-2114 **$56.95**
300W (for 24V) Cat. MT-2134 **$74.95**

JAYCAR JC50 10" 3 WAY SPEAKER KIT

NEW MEM

Ref: Electronics Aust. Dec. 1998. Enjoy the full and rich sound of a sophisticated three way speaker system by putting it together yourself and save hundreds of dollars in the process.

Quotes by Rob Evans from EA "The JC50's sound very good indeed. This is not a statement given lightly either". "The sound is consistant and balanced over a wide range of listening angles" "The treble range is very extended and detailed, while the low end delivers a nice degree of lowdown *punch* without sounding lean or soggy". "This all adds up to a speaker system that's very enjoyable to listen to over its full power range, with no sign of listening fatigue, you'd normally pay thousands of dollars for that privilege....."

SPECIAL FREIGHT DEAL
Anywhere in Australia by Road freight for full Kit with Cabinets Only $30 plus insurance $9

Speaker Kit
Consists of:
- 2 x 10" Re/sponse polycone woofers
- 2x Re/sponse dome midrange •2 x Vifa D19 dome tweeters
- 2 x prebuilt crossovers
- Rear terminals, ports, screws, cable and lining material.

Cabinets
Consists of 2 prebuilt cabinets, finished in black-grey oak. Speaker grill cloth pre-mounted on removeable frames. The power handling is 120W RMS / channel, and the cabinet size is 845(H)x300(D)x295(W)mm.

BUY TOGETHER FOR $869 pair

SPEAKER KIT Cat. CS-2550 **$579Pr**
CABINETS Cat. CS-2552 **$319Pr**
$898Pr

The power handling is 120WRMS/channel, and the cabinet size is 845(H) x 300(D) x 295(W)mm.

FAST NICAD CHARGER WITH DISCHARGER

The "It does everything charger". Charges AA, AAA, C and D Nicads in 4 hours. See 98 Cat. page 86 for full details. Cat. MB-3500

Normally $69.95
Only $49.95
Save $20!!

5 MTR PRO OFC LEAD

Double sheilded with metal plugs and centre lead. Cat. WA-1094

Was $34.95
Jan $20
Save $14.95

COMPACT BLACK LIGHT FLUORO

NEW MEM

Great for parties. It is a compact incandescent lamp with a ultra violet coating. It will fit any 240V AC standard globe socket and is rated at 13 watts compact (equiv to 70 watts normal).
Cat. SL-2762

$19.95

HARD DRIVE COOLING KIT

NEW MEM

Installs easily in any vacant 5.25" or 3.5" slot in minutes and will dramatically improve the ventilation within the case using dual high efficiency ultra quiet cooling fans. The air filter is easy to access and the kit is supplied with Y adaptor for easy connection to any hard drive.
Cat. XC-5046

Only $39.95

RJ45 PC MOUNT SOCKET

RJ45 8/8 top entry PC mount socket. Black in colour.
Cat. PS-1445

$1.00 NEW MEM

HEAVY DUTY MAINS SURGE PROTECTOR

NEW MEM

We've made a scoop purchase of 100 only very high quality mains surge protectors. This protector is in a very heavy anodised steel case, and has 4 individually switched sockets and illuminated rocker switch. It features initial protection with a circuit breaker and spike reduction circuit, followed by two stage high frequency filtering for maximum protection. The black outlets have single stage filtering for less sensitive items such as printers and plotters, while the white outlets with 2 stage protection suit the computer and monitor. Made in Australia. SAA approved N11895.

Freq.Common Mode Noise Rejection Specifications

(MHz)	First Stage	Second Stage
0.50	66.8dB	>90.0dB
1.00	-81.2dB	>90.0dB
5.00	-62.5dB	-73.1dB

Size 440(L) x 100(W) x 50 (D)mm.

Module Specifications

Max Input Voltage	250VAC
Max Total Load	10A 2400VA
Input Varistor Rating	275VAC 6500A/20µs
Output Filter Type	Dual LC Filter
No. of Outlets	4

Cat. MS-4015

Normally sell for $269
Save about $100
These are only $165

BUY 5 OF A PRODUCT WORTH $100 OR MORE LESS 10%

MAIL ORDER - FREECALL FOR PHONE ORDERS 1800 022 888

NI-MH RECHARGEABLE BATTERY BREAKTHROUGH!!

We all know that NI-MH batteries offer better features than NI-CADs. These include •No memory effect •Higher current capacity •High drain performance •And now - Lower prices.

AAA 550MAH NEW ITEM
Previously Ni-cads were 280MAH
NIPPLE Cat. SB-2430 **$5.50ea**
SOLDER TAG Cat. SB-2431 **$5.75ea**

AA 1000MAH
NIPPLE Cat. SB-2455 **$4.25ea**
SOLDER TAG Cat. SB-2457 **$4.50ea**

AA 1300MAH
NIPPLE Cat. SB-2438 **$5.25ea**
SOLDER TAG Cat. SB-2439 **$5.50ea**

SUB C 2500MAH
SOLDER TAG Cat. SB-2432 **$9.95ea**

C SIZE 3300MAH
NIPPLE Cat. SB-2433 **$12.95ea**

D SIZE 7400MAH
NIPPLE Cat. SB-2434 **$27.95ea**

12V ACTIVE COLOUR ANTENNA UHF / VHF / FM

IDEAL FOR CARAVANS, CARS, CAMPING AND HOUSES WITHOUT 240VAC MAINS! NEW ITEM

The antenna contains a built-in amplifier that operates from 12VDC. It can be powered from the vehicle's battery and/or use it at home with the optional AC mains adaptor. (MP-3002 $12.95). The antenna has telescopic dipoles at the rear for fine-tuning your reception, while the amplifier has a built-in splitter for a second TV antenna, a 6 metre coaxial lead with plugs, and a 12V power lead. Specifications: •Gain 22-24dB •Power source: 12VDC, 100mA •Antenna size: 340(W) x 375(L) x 55(D)mm.

Cat. LT-3170 **$59.95**

DIGITAL HYGROMETER

With memory. Large display. Cat. QM-7202
Was $59.95 Save $10 Now $49.95

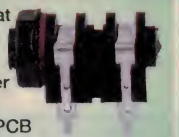
IN/OUT THERMOMETER

With memory. Large display. Cat. QM-7205
Was $39.95 Save $5 Now $34.95

TALKING IN/OUT THERMOMETER

See 98 Cat. P204 for details. Cat. QM-7215
Was $34.95 Save $10 Now $24.95

MONO CHASSIS SOCKET BARGAIN



Grab some at this crazy price! The manufacturer shipped us these, with PCB pins with different spacing to our normal stock. Limited quantity avail. Cat. PS-0161
Normally $1.75ea
Only 10 for $10

6P/4C WALL SOCKET NEW ITEM

Square wall socket to suit 6P/4C RJ12 plugs. Screw terminals for connection. Size 44 x 44 x 24(D)mm. Limited qty. Special price. Approved. Cat. YT-6059
only $3.95

USB TYPE A - A LEADS

1M Cat. PL-0925 **$12.95**
2M Cat. PL-0926 **$14.95**

PC SLOT 2 X TYPE AA FLYLEAD
Cat. PL-0929 **$24.95** NEW ITEM

Passive Infra Red & Microwave In 1

The ultimate in PIRs for home/warehouse burglar alarms. Requires both the PIR and microwave to be triggered at the same time, virtually eliminating false alarms. Were selling for $99.50 in 1996!

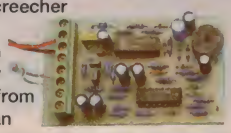
JANUARY DEALS

10m range for home Cat. LA-5012
Buy 1 for $55ea / Buy 4 for $50each
30m for hallway/warehouse Cat. LA-5013
Buy 1 for $60ea / Buy 4 for $55each

NEW JAYCAR KIT

SCREECHER CAR ALARM MKII

With high deterrent capacity for a minimum outlay, the Screecher MKII is more effective than the extremely popular MKI from 1986. Using an 'ear-piercing' piezo siren, this alarm will scare the pants off any would be thief. This simple to construct project features entry delay with soft warning tone, exit delay & high intensity deterrent LED. Kit includes PCB, siren, all electronic components and two warning stickers. Cat. KA-1813 **$29.95**



DON'T FORGET TO VISIT OUR WEB SITE: www.jaycar.com.au

NEWCASTLE STORE MOVED

TO: SHOP 4, 990 HUNTER STREET. NEWCASTLE. 1KM WEST. OPPOSITE SELMA STREET.

EMAIL ORDERS: mailorders@jaycar.com.au WHOLESALE EMAIL: wholesale@jaycar.com.au

Jaycar ELECTRONICS

HEAD OFFICE
8-10 LEEDS ST RHODES 2138
PHONE: (02) 9743 5222
FAX: (02) 9743 2066

Quality Endorsed Company ISO9002 Lic 6143 Standards Australia

WHOLESALE
PHONE: (02) 9743 5222
ORDERS: 1800 620 169
FAX: (02) 9743 3070
FREEFAX: 1800 810 137

MAIL ORDERS FREE POST TO:
Reply Paid 72. Jaycar Mail Orders. PO Box 185 Concord NSW 2137 FREE CALL FOR ORDERS: 1800 022 888
ENQUIRY HOTLINE: (02) 9743 6144 FAX: (02) 9743 2066

ROAD FREIGHT ANYWHERE IN AUST (up to 20kg) $14.00

POST & PACKING $10 to $24.99=$4.00 $25 to $49.99=$5 $50 to $99.99=$7 OVER $100=$8

bankcard MasterCard VISA Diners Club International AMERICAN EXPRESS eftpos

VISIT OUR WEBSITE www.jaycar.com.au

ADELAIDE SA	•191-195 Wright St (Cnr. St. Lukes Pl.) •Ph:(08) 8231 7355 •Fax:(08) 8231 7314 •Mon/Fri:9-5.30 •Fri:9-8.30 •Sat:9-4
BURANDA QLD	•144 Logan Rd •Ph:(07) 3393 0777 •Fax:(07) 3393 0045 •Mon/Fri:9-5.30 •Thurs:9-8.30 •Sat:9-4
ASPLEY QLD	•1322 Gympie Rd, cnr Albany Creek Rd •Ph:(07) 3863 0099 •Fax:(07) 3863 0182 •Mon/Fri:9-5.30 •Thurs:9-8.30 •Sat:9-4
CANBERRA ACT	•121 Wollongong Street, Fyshwick •Ph:(02) 6239 1801 •Fax:(02) 6239 1821 •Mon/Fri:9-5.30 •Sat:9-4
MELBOURNE CITY	•Shop 2,45 A'Beckett St •Ph:(03) 9663 2030 •Fax:9663 1198 •Mon/Fri:8.30-5.30 •Fri:8.30-8.30 •Sat:9-4 •Sun:10-4
COBURG VIC	•266 Sydney Rd •Ph:(03) 9384 1811 •Fax:(03) 9384 0061 •Mon/Fri:9-5.30pm •Fri:9-8.30 •Sat:9-4
SPRINGVALE VIC	•887-889 Springvale Rd Mulgrave Nr Cnr. Dandenong Rd •Ph:(03) 9547 1022 •Fax:(03) 9547 1046 •Mon/Fri:8.30-5.30 •Fri:8.30-8.30 •Sat:9-4 •Sun:10-4
HOBART TAS	•140 Campbell St. Hobart •Ph: (03) 6231 5877 •Fax:(03) 6231 5876 •Mon/Thur:9-5.30 •Fri:9-7 •Sat:9-4
SYDNEY CITY	•129 York St •Ph:(02) 9267 1614 •Fax:(02) 9267 1951 •Mon/Fri:8.30-6 •Thurs:8.30-8.30 •Sat:9-4 •Sun:10-4
BANKSTOWN	•363 Hume Hwy Cnr Meredith •Ph:(02) 9709 2822 •Fax:(02)9709 2007 •Mon/Fri:9-5.30 •Thurs:9-8.30 •Sat:9-4 •Sun:10-4
GORE HILL	•188 Pacific Hwy Cnr. Bellevue Ave •Ph:(02) 9439 4799 •Fax:(02)9439 4895 •Mon/Fri:9-5.30 •Thurs:8.30 •Sat:9-4 •Sun:10-4
PARRAMATTA	•355 Church St (Cnr. Victoria Rd) •Ph:(02) 9683 3377 •Fax:(02) 9683 3628 •Mon/Fri:9-5.30 •Thurs:9-8.30 •Sat:9-4 •Sun:10-4
PENRITH	•199 High St •Ph:(02) 4721 8337 •Fax:(02) 4721 8935 •Mon/Fri:9-5.30 •Thurs:9-8.30 •Sat:9-4 •Sun:10-4
RHODES	•8-10 Leeds St •Ph:(02) 9743 5222 •Fax:(02) 9743 2066 •Mon/Fri:9-5.30
NEWCASTLE	•990 Hunter St. (Opp. Selma Street) •Ph:(02) 4965 3799 •Fax:(02) 4965 3796 •Mon/Fri:9-5.30 •Sat:9-4
PERTH	•326 Newcastle St Northbridge •Ph:(08) 9328 8252 •Fax:(08) 9328 8982 •Mon/Fri:9-5.30 •Thurs:9-7.00 •Sat:9-4
NZ	•Mon - Fri: 9-5.30 Sat: 9-5.30

***OVERNIGHT DELIVERY** AVAILABLE ON REQUEST
Subject to conditions: •Max weight 3KG (inc cubic) $10 •No dangerous goods •Max weight 5kg (inc cubic) $16 •Stock & availablity •Orders must be received before Midday E.S.T.

NEW JAYCAR STORE IN NEW ZEALAND •14A Gillies Ave. Newmarket. Auckland •Ph: (09) 529 9916
MAIL ORDERS: P.O. Box 9667. Newmarket. Auckland. FREE POST: 104345

The Screecher Car Alarm MkII

If evil could manifest itself in a car alarm, this may well be it! Based on our popular design from way back in 1986, the Screecher MkII uses a high-output, compact piezo siren to blast an intruder *inside* your car, making it too uncomfortable for them to stay. This new low-cost alarm is very compact, easy to install, and above all else, extremely effective. Is it valid retribution, or just downright nasty? It's up to you to decide...

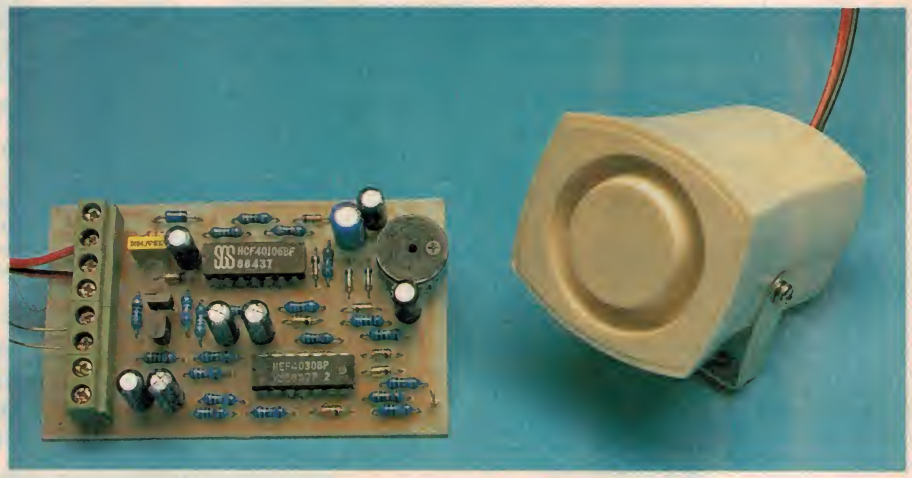
by Rob Evans

SINCE THE ORIGINAL Screecher alarm project appeared in the August 1986 issue of *Electronics Australia*, it's been a very popular project, with hundreds and hundreds built over the following years. Its appeal is most likely due to the low kit price and the effectiveness of the end result — plus of course the unfortunate fact of life that the need for car alarms hasn't gone away...

Fiendishly simple in its concept, the Screecher relied on the characteristics of a compact piezo siren to flood the interior of the car with an eye-watering, warbling 'screeching' centred at about 2kHz — right where it hurts. The alarm's electronics were fairly simple and used just two CMOS chips to deliver all of the basic alarm features, such as exit and entry delays, a flashing warning light and edge-sensitive trigger inputs.

There was one feature of the original circuit that appears to have finally tripped it up though, and that's its 'soft' warning function — which powered the siren with a reduced current just before it switched to full blast. The low drive current meant that the siren put out a vastly reduced volume, and reminded an absent-minded owner that they had just a few seconds to turn off the Screecher before they became audibly abused, like a common car thief...

Unfortunately though, it seems that the more recent versions of compact piezo sirens don't respond terribly well to a reduced drive current. In short, their internal oscillator/drive circuitry has changed to a point where just won't produce any sound until 'started' by a relatively high current from the full 12V supply. As the original Screecher circuit powered the siren via a series resistor during the warning period, the newer sirens will not produce an output at this time, with all of the drive voltage ending up across the (now rather warm) current limiting resistor.



The Screecher's PCB assembly and its piezo siren are quite small, but the combination will have a big effect on an intruder in your car. The siren may look cute, but believe us, it's not...

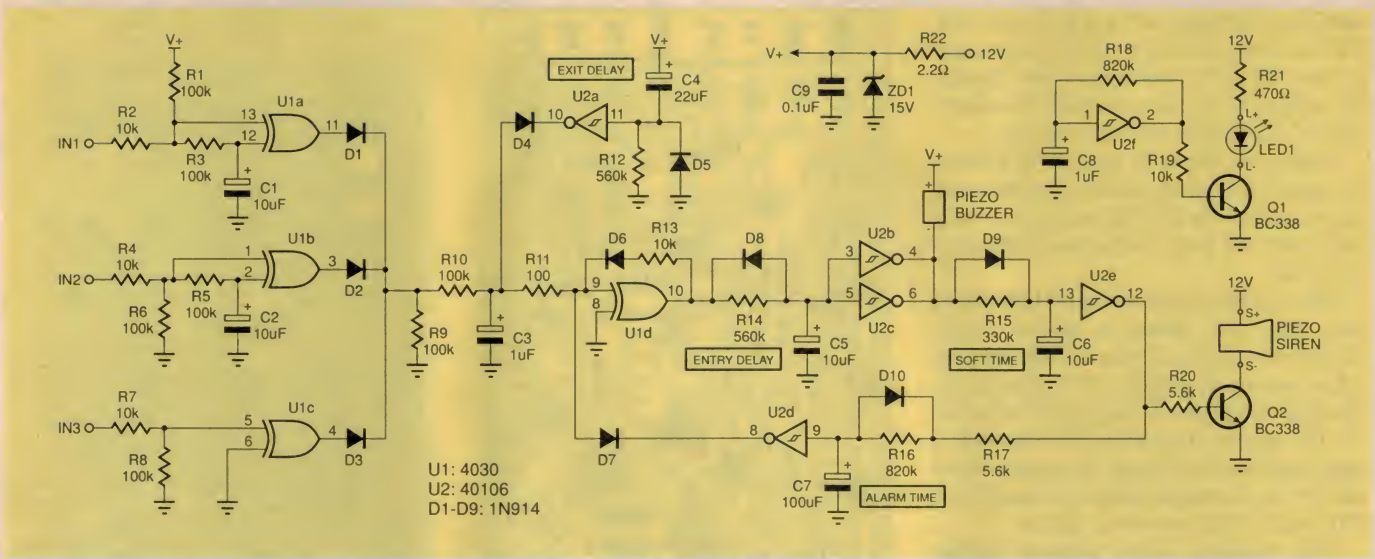
With a sample of the new type of siren arriving at *EA* (courtesy of Jaycar Electronics), it was time for a revised Screecher circuit that would use some other arrangement for the soft warning function. As you've probably guessed, the simplest approach turned out to be adding a separate, small piezo sounder that's activated for just the soft warning function, while the real piezo *siren* is left to do what it's good at: making an intolerable noise during the actual alarm period.

While we were developing the new Screecher circuit we also took the opportunity to improve a couple of other aspects of the design, to make it even more useful. One of them is fairly straightforward, and that is a substantial reduction in the overall size of the PCB assembly — so that it's easier to install amongst the typically crowded vehicle wiring.

The other improvement is relatively minor, and involves the choice of ICs used in the various RC timing circuits. These ultimately set the exit and entry delays, plus the soft warning and alarm-sounding times. Here we've used the Schmitt-trigger style of CMOS gates on all RC timing circuits, so that the delay periods are both reliable and (relatively) predictable.

We've also elected to use a high intensity LED rather than an incandescent lamp for the dashboard-mounted indicator, in line with more recent alarm systems. This has the added advantage of longevity, as the LED will last far longer than a conventional lamp.

So there we have the updated Screecher car alarm. As with the original design, the Screecher MkII alarm offers a high deterrent capability for a minimal outlay, and as a result should remain a popular project amongst car owners.



In spite of using just two CMOS ICs, the Screecher's circuit provides all of the essential alarm functions such as entry and exit delays, transition-sensitive input triggers, a flashing warning LED and a timed alarm period with automatic reset.

Circuit details

The Screecher's circuit operates in the same basic way as the original version, with the input-sensing stages triggering a latch, and this in turn enabling the entry, warning, and alarm duration timers. The most significant change in our new circuit is that the piezo siren is no longer driven at a reduced current during the 'soft' warning period, since this is handled by a small piezo buzzer driven directly from the circuit, as mentioned above. The siren is only used for the actual alarm period, where it's switched fully on.

In more detail, all three trigger inputs are based on the action of exclusive-OR (XOR) gates U1a to U1c, which by definition, will drive their outputs high when their two input pins are at different logic levels. Starting with the 'IN1' circuit shown in the schematic, you can see that U1a's inputs are effectively tied together by R3, which is in turn pulled to V+ via R1. Under static conditions then, C1 is charged to V+, while the XOR gate's output is low since *both* of its inputs are high.

If a low level trigger is applied to IN1 however, the junction of R1 and R3 is pulled low via R2, which pulls U1a pin 13 low and begins to discharge C1 via R3. With pin 12 still high and pin 13 low, the XOR gate output goes high.

Assuming that the low level at IN1 remains, C1 will discharge to a point where pin 12 is now at a low logic level, matching that at pin 13. The XOR gate (U1a) inputs are now at the same level again (both low instead of both high), so its output falls. This process takes around one second to complete, and as a result, the following circuitry receives a single pulse when IN1 is pulled low by a trigger event.

Note that the reverse of this sequence takes place when the trigger condition at IN1 is removed, since the gate inputs will again be at different levels while C1 charges back to its normal state via R3 and R1. The circuit therefore responds to *changes* in level at IN1, which in practice means that the alarm will trigger when (say) a door is opened *or* closed.

By the way, a short duration (much less that one second) change at IN1 will cause an equally short pulse at U1a's output, with little change occurring in the charge on C1. In this case, the stage acts as a simple inverter.

The circuit for input IN2 acts in the same manner as that for IN1, except that this stage is arranged to suit an input that is normally low, such as a lamp circuit that switches to +12V. As before, the delay capacitor (in this case C2) forces the gate inputs to be at different levels for a short period, after each change in level at the input. Since the XOR gate drives its output high when its inputs don't match, this stage also produces a positive pulse in response to an input trigger.

As the Screecher's circuit had one XOR gate left over during development (U1c), this has been pressed in service as an extra but simplified trigger input stage (IN3). U1c merely acts as a buffer in this case, so its output just reflects the logic level at the input rather responding to a level *transition*, as is the case with U1a and U1b. IN3 could perhaps be used with a panic switch, an ultrasonic sensor, or for some other overriding trigger condition.

The outputs of all three input stages are combined by the diode OR gate made from diodes D1 - D3, which passes the high-going trigger level to a delay circuit formed by R10 and C3. With a time constant of around 100ms, this will reject short pulses coming from the input stages and therefore prevent false triggers due to dirty switch contacts or stray electrical interference.

Ignoring the effect of D4 and D7 for the moment, the resulting trigger level at C3 is then passed to the main alarm latch via R11. The latch circuit is based on XOR gate U1d, which is configured as a non-inverting buffer stage and has a positive feedback path via R13 and D6. A high at its input (pin 9) is transferred to the output (pin 10), and this in turn holds the input high through R13 and D6 when the trigger pulse ends.

With the trigger now latched in U1a, the high at its output begins to charge the entry delay timing capacitor C5, via R14. After about six seconds the rising voltage across C5 is sufficient to cause the outputs of inverters U2b and U2c to drive low, which in turn activate the small piezo buzzer.

The buzzer then continues to sound — indicating something quite ghastly is about to happen — while the low at the outputs of U2b and U2c discharge C6 via R15. This is the so-called 'soft warning' period, and it effectively ends when the level at C6 falls to a point where the output of U2e goes high (around four seconds later). R2 couples this high to the base of Q2, which in turn switches the full 12V supply across the piezo siren.

With the siren sounding, the Screecher continues in this mode while the output of U2e charges C7 via resistors R17 and R16. U2d will then drive its output low after a delay of about 80 seconds, which in turn pulls the pin 9 of U1d low via D7. This rapidly discharges C3, and sets this part of the circuit back to its quiescent state.

The low at the output of the now reset latch (pin 10 of U1d) quickly discharges C5 via D8, the outputs of U2b and U2c go high (shutting off the piezo buzzer), and C6 is quickly charged to V+ via D9. The ripple effect continues with the output of U2e going low, which turns off Q2 and the piezo siren,

and also discharges C7 via R17 and D10. R17 has been included in this RC timer stage to limit the C7's discharge current through the output of U2e, since at 100uF this electro carries a significant amount of energy.

Finally, the low at the input of U2d forces its output high, which releases the latch reset action applied via D7. The Screecher is now fully reset and ready for the next alarm trigger pulse.

The exit delay timer based on U2a comes into play when power is applied to the Screecher's circuit, as you activate the unit when leaving the vehicle. C4 is initially discharged, and begins to charge via R12 as the V+ rail appears. This holds U2a's input at a high logic level for around 12 seconds, while the low at its output holds the junction of R10 and R11 at a low level, via D4.

This clamping action prevents trigger pulses from the diode OR gate (D1 to D3) passing to the alarm latch (U1d), and in effect, disables the circuit for the 12 second exit period. This also ensures that C3 is initially discharged, and sets all the circuit's timing capacitors in their quiescent state.

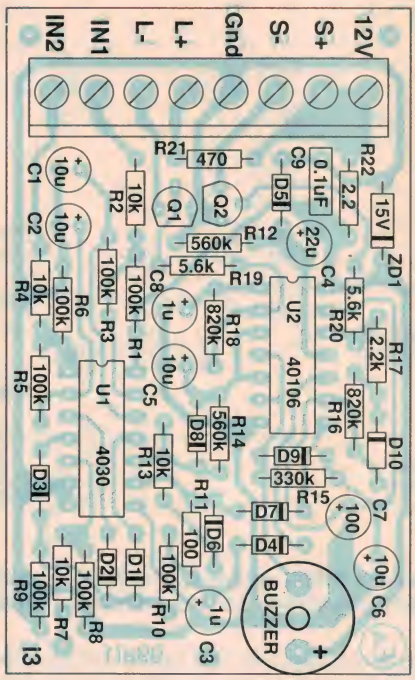
The remaining parts of the circuit involve the supply protection network based on zener ZD1, plus the warning LED flasher stage formed around U2f. Here, U2f acts as a simple relaxation oscillator with C8 and R18 setting the frequency at about 1Hz, while its output drives switching transistor Q1 via R19. R21 limits the current through LED1 to about 20mA.

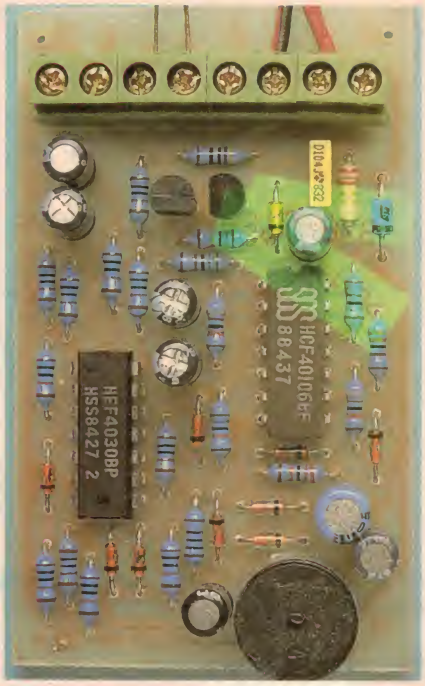
Since voltage spikes are not uncommon in 12V car electrical systems and these would quickly destroy the circuit's CMOS chips, ZD1 has been included to limit V+ to a maximum of 15V. Any momentary excess in voltage is taken up by limiting resistor R22, while C9 acts as a bypass to high-frequency energy imposed on the supply rail.

Construction

We've purposely made the new Screecher's PCB very small, so that the final unit will be easy to install and hide under the vehicle's dashboard or instrument panel. The PCB (coded 99al1) measures just 76mm x 46mm, and all of the components except the piezo siren and the warning LED fit onto the board, which as you can see from the shots of the prototype has a set of screw terminals down one side to accommodate the external wiring.

Because of its small size though, some constructors may find the PCB a little fiddly to assemble and the piezo buzzer *may* need to be mounted off the board, if it's larger than ours. The buzzer used in the prototype is neat little unit that produces quite a high output level at around 2kHz, while only consuming about 12mA. Note that since the buzzer is driven directly from the output of two gates (U2b and U2c), it must of the low-





Use both the component overlay diagram shown on the left and the photo on the right as a guide to constructing the unit. Note that piezo buzzers with a diameter of more than 15mm won't fit in the allotted PCB space, and will need to be connected via flying leads.

current type — say 15mA or less.

Start the construction in the usual way, by fitting the lower profile components (resistors and diodes) into the board, then work your way up to the larger parts. If the resistors are the five-band close tolerance type it may be best to check the value of each one with a multimeter, as they're installed.

Use the component overlay as a guide during the construction, and as usual, take particular care with the orientation of any polarised components such as the semiconductors (including the diodes) and electrolytic capacitors. Also, if you think the extra trigger input (IN3) may be of use, fit a PCB terminal pin to the relevant PCB pad (near R7 and R8) so that a sensor wire can be attached at a later stage.

Testing it

With the Screecher PCB assembly completed, there are a few checks you should really do before the unit is installed. Remember that once it's been fitted into some inaccessible location under the vehicle's dashboard it will be very difficult to faultfind the Screecher itself, so a few tests at this stage may save headaches (literally!) later on...

To perform the basic checks, first attach a LED directly to the 'L+' and 'L-' terminals on the PCB, wire in the piezo buzzer (if it couldn't be mounted on the board), then arrange a 12V source for the '12V' and 'Gnd' connections. Take care with the polarity of these connections, and at this stage, *don't* wire in the piezo siren.

Connect the 12V source last, and immediately note the action of the LED — it should begin to flash at about 1Hz. If R22 goes up in smoke instead, you've either connected the 12V source with the wrong polarity or the zener (ZD1) is installed the wrong way around.

Assuming success though, the circuit should now stay in this passive stage until triggered. If the piezo buzzer begins to sound, this would indicate some kind of trouble in the exit delay circuit (based on U2a), as this should normally force the whole circuit into its reset state.

Next, you can manually trigger the alarm by carefully using a clip lead or length of hookup wire to pull IN1 to ground, or IN2 up to 12V. If you have waited for at least 12 seconds after the unit was powered up, the piezo buzzer should then begin to sound six seconds or so after your induced trigger.

You can then use a multimeter between the 'S+' and 'S-' terminals to check that 12V appears four or so seconds after the buzzer begins to sound, indicating that the siren would have been activated. This voltage should remain present for at least a minute, then shut down as the alarm goes back into its reset state.

If any step in this sequence of events fails to occur, you should be able to trace the action through the circuit with your multimeter to find the source of trouble. Start with the output of the diode OR gate — or even at the input stage you actually triggered — then progressively work your way through, monitoring the action at each gate's output.

Finally, check the exit delay function by making sure that the circuit won't respond to a trigger for about 12 seconds after power is applied. And if you intend to use the IN3 connection, you might like to test its action as well.

Now that the basic checks are complete and you're ready to install the Screecher, take a moment to consider how the various delay times will suit your needs. If you'd like a slightly longer exit time, or perhaps a little more warning before the siren bursts into song, this is the time to make those changes.

Fortunately though, this is fairly straightforward, and just involves altering the RC time constant in the relevant section of the circuit. As a rule of thumb, the delay time will *roughly* equal the product of R and C, so increasing the soft time warning period to say, five seconds would mean changing the value of R15 to 560k — 10uF x 560k = 5.6 seconds.

Installation

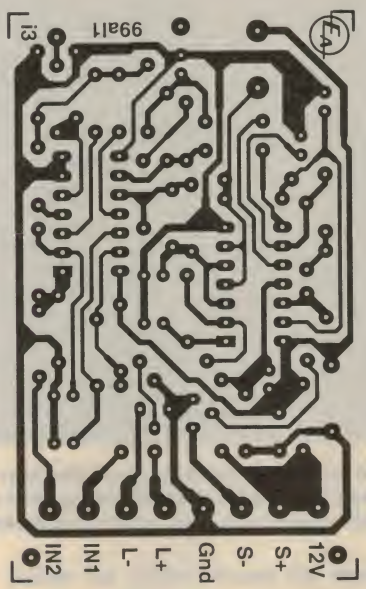
Just how you fit the Screecher to a vehicle will really depend on how many trigger inputs you wish to use, and of course, the physical constraints of the under-dash area. The quick installation approach is to just wire one trigger input to the door switch and interior light circuit, then tap into the vehicle's main 12V supply via a hidden power switch.

You'll also need to wrap the circuit in a protective covering or mount it in a small plastic case, plus fit the warning (high intensity) LED into some visible location on the dash panel. The siren itself can be solidly mounted well under the dash, or just jammed in some convenient location — it should be fairly inaccessible though, so an intruder can't quickly locate the wiring.

With this simple approach the Screecher is still very effective, and in practice you just enable the alarm using the hidden power switch, as you leave the vehicle. There are many other ways the alarm could be both activated and triggered of course, but we'll leave that to your imagination and constraints of the vehicle itself.

It's really not critical as to which of the main trigger inputs (IN1 and IN2) you use on the car's wiring by the way, since they respond to a *change* in level, rather than the actual static voltage. However, as IN1 is a normally-high configuration, it should ideally be connected to a circuit that is also normally high, such as a door switch circuit that has the lamps wired to 12V, and the switches connecting to ground. As you'd expect, the inverse is true of IN2, which is intended for normally-low sensor circuits.

As a last point, while the piezo buzzer should put out quite a reasonable and hopefully noticeable level, if the Screecher is buried well under the dashboard or is housed in a protective case the warning sound may be difficult to hear — with dire consequences! It's worth checking for this problem during the installation process (connect the siren *last*) so that you can correct the situation. This may involve fitting the buzzer in some other location under the dash via connecting leads, or just drilling a number of sound-exit holes in the case. ❖



A full sized version of the PCB artwork, should you wish to make your own board.

PARTS LIST

Resistors

R1,3,5,6,8,9,10	100k
R2,4,7,13	10k
R11	100 ohms
R12,14	560k
R15	330k
R16,18	820k
R17	2.2k
R19,20	5.6k
R21	470 ohms
R22	2.2 ohms

Capacitors

C1,2,5,6	10uF 16V electro
C3,8	1uF 16V electro
C4	22uF 16V electro
C7	100uF 16v electro
C9	0.1uF MKT

Semiconductors

U1	4030 quad XOR
U2	40106 hex Schmitt inverter
Q1,2	BC338 NPN transistor
ZD1	15V 1W zener
LED1	High intensity LED
D1-10	1N914

Miscellaneous

PCB coded 99a11, 76 x 46mm; small piezo buzzer, 15mA or less; compact piezo siren; 8-way PCB-mount screw terminal strip.

Solid state voice recorder

This easy-to-build project from Oatley Electronics features a professional quality 28-pin sound storage IC that can deliver 20 seconds of good quality sound, or by changing a single resistor, up to 30 seconds of reasonable quality sound. A kit costs only around $19, and includes a speaker, microphone and all parts. Solid state audio recording has never been so cheap...

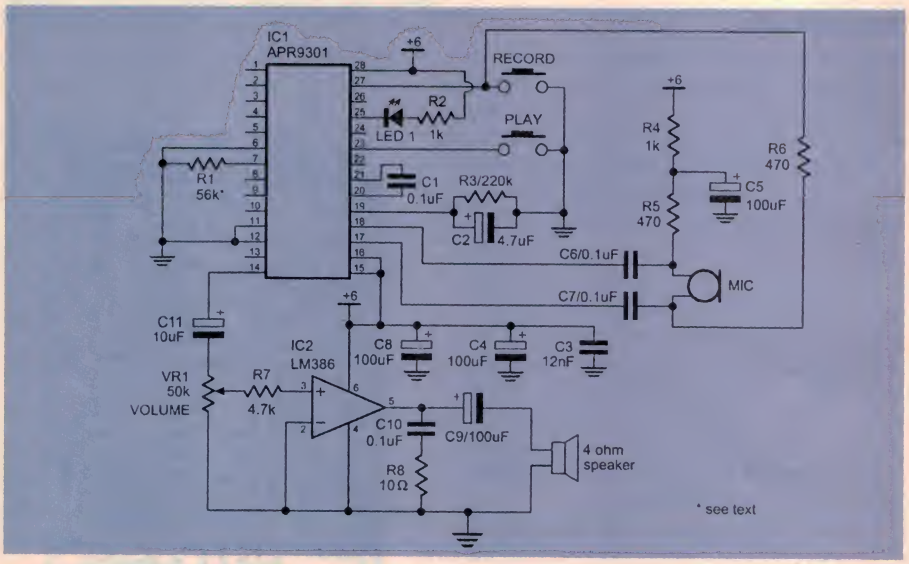
by Peter Phillips

SOLID STATE recording systems are no longer confined to toys and other gadgets, thanks to the continuing development of ICs that deliver an output that sounds almost natural. The IC in this project is dubbed the APR9301 (no, it's not a 1993 April fool's joke), and uses a technology found only in professional quality sound recording/playback ICs. The IC manufacturer describes it thus: *Invox' proprietary analog/multi-level storage technology is implemented in advanced Flash non-volatile memory cells, each of which can typically store more than 256 voltage levels. The APR9301 stores and reproduces voice signals in their natural forms, eliminating the distortion that is often introduced by encoding and compression.*

The IC has outputs to directly drive a 16Ω speaker, but to give a higher sound level and to allow the inclusion of a volume control, this project incorporates an LM386 audio amplifier IC. Sound is recorded via an electret microphone module, and recording is achieved by holding down a pushbutton for the duration of the recording (i.e., level-activated). A LED lights while recording is in progress, and a recording is retained for 100 years without battery backup. This means you can change a recorded message by changing ICs.

Playback occurs when another pushbutton is momentarily pressed (edge-activated), and lasts only for the length of the recording. That is, if the new message is less than the total storage time, playback stops at the end of the message rather than continuing with the remainder of the previously stored message. Playback is always from the start of the message, and can be interrupted by pressing the play pushbutton. Pressing the button again causes the message to start from the beginning.

But is the sound quality all the manufacturer claims it to be? To find out, we recorded various kinds of sounds into the IC (via the on-board microphone), including symphonic and popular music, and speech. To minimise playback distortion, we connected the output of the APR9301 to a conventional amplifier/speaker system, rather than use the LM386 and small speaker included in the kit.



The full circuit for the project. Resistor R1 determines the sampling frequency, and hence the available length and quality of a recording. During playback, IC1 produces an audio output at pin 14, which is coupled to IC2 through the volume control VR1.

Although the upper frequency limit is probably around seven to eight kilohertz (in 20-second record mode), on playback we found recorded music sounded full-bodied and satisfying. Speech sounded very clean and natural — on a par with a cassette recording.

The playback sound quality from the LM386 and small speaker supplied in the kit is, as you'd expect, not as good, but still more than adequate for most purposes. So you have the option of high level quality sound by using an external amplifier, or reasonable quality sound using the on-board amplifier.

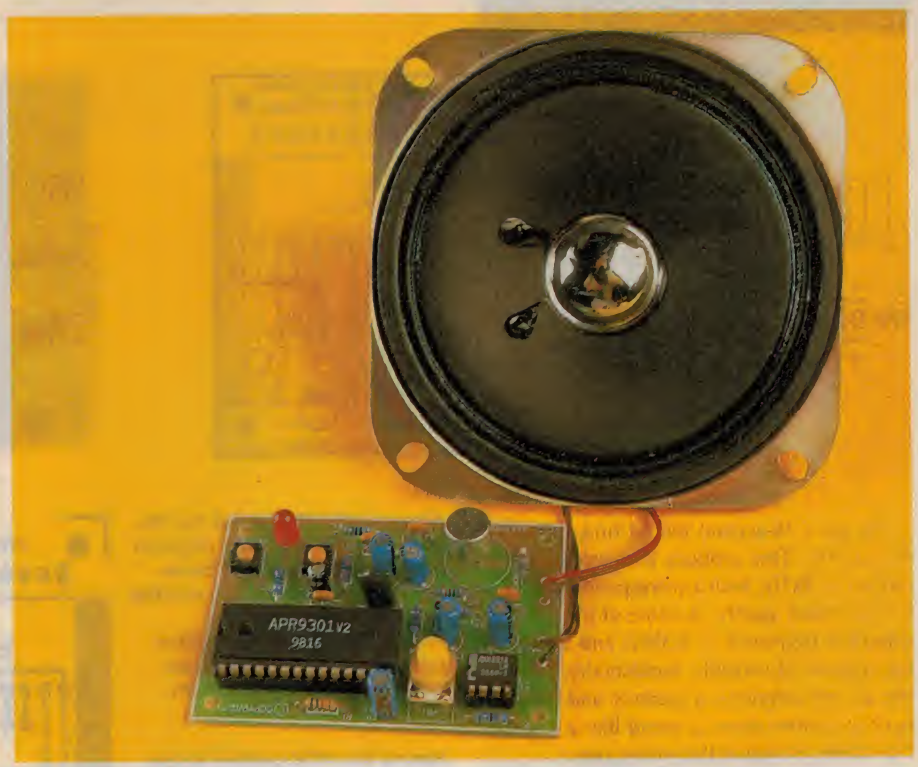
But why would you want a high level quality sound from such a device? Here's a few ideas.

Applications

A solid state recording system like this one is generally used for speech. For example, rather than leave a written note, you could record your message, and ask only that the recipient 'presses the button'. You'll find you can say quite a lot in 20 seconds. You could also incorporate the system into items of equipment to provide help on operating the equipment, to give a warning, a promotional message or even to remind the user to turn the equipment off after use.

But because of the potential sound quality, there are other less obvious uses, including part of an alarm system. For example, you could record the bark of a really vicious sounding dog, with playback via a suitably loud audio amplifier and speaker system. Or you could record a message that starts with

This solid state voice recorder gives 20 seconds of quality sound, and includes everything to record and playback a voice message, music or any sound.



the sound of a phone being dialled, and a security guard answering, followed by enough conversation to suggest to an intruder that the guard is 'on his way to your address'.

Because of the low cost for a kit of parts for this project, it's feasible to build a number of them, along with further electronics to make each unit play as required. In an alarm system, the first message might be a warning only. If the alarm system continues to pick up evidence of an intruder, a second and more dramatic message could be initiated. Such a system could be made portable (battery operated) and used as a 'Claytons' alarm system in any location. To achieve this, you could use a PIR detector, along with some simple electronics to trigger the required playback unit.

There are no doubt many other applications, which we'll leave to your imagination. We also need to leave the design of these applications to you. The important thing is that this project provides the basis for some quite imaginative uses. Now let's look at the circuit of the project.

Circuit details

Starting with the record section, signal input is via an electret microphone element which is powered through R4 and R5. The microphone output is coupled to IC1 through capacitors C6 and C7, with pin 17 of IC1 the signal input and pin 18, in effect, the earth. The RC network connected to pin 19 forms part of the IC's automatic gain control (AGC) system. As shown in the block diagram of IC1, pin 20 is an analog input (50mV p-p max) and pin 21 is an analog output. In this application, these pins are coupled by C1. If required, you can feed an audio signal directly into the IC, by removing C1 and connecting the signal between pin 20 and earth.

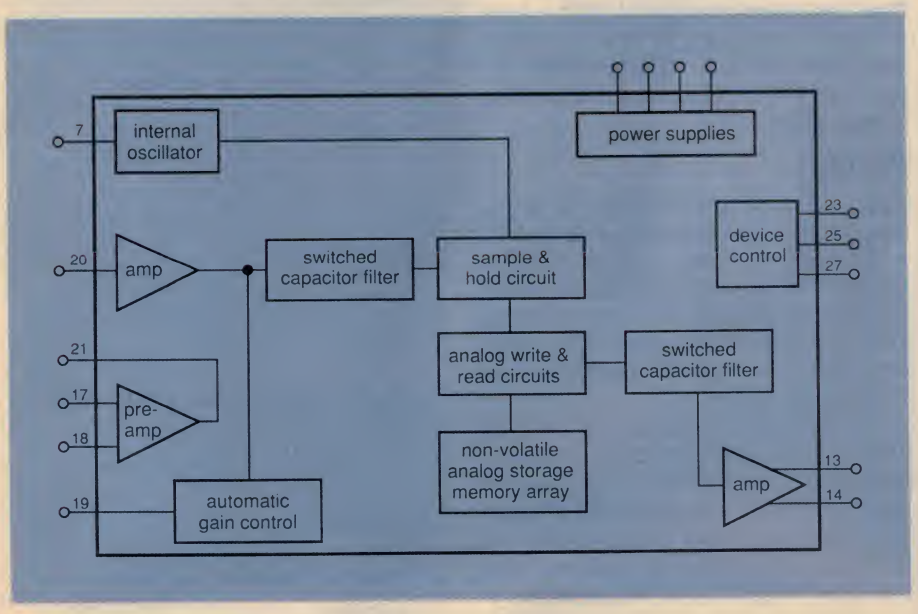
Recording occurs when pin 27 is low, achieved with a pushbutton and indicated by the LED connected to pin 25. Notice that when this pushbutton is pressed, the return DC path for the microphone is completed through R6. Recording stops either when the pushbutton is released or when the internal memory of IC1 is full, indicated by the LED turning off.

Playback is initiated when pin 23 is pulsed low, and continues until either the end of the stored message, or when the end of memory is reached. According to the data sheet for the IC, if a newly recorded message is shorter than the previous message, the new message is played, followed by the remainder of the previous message. However we found the IC played the new message only, which is surely better than the way the data sheet suggests. Perhaps there's been a revision to the IC and not the data sheet.

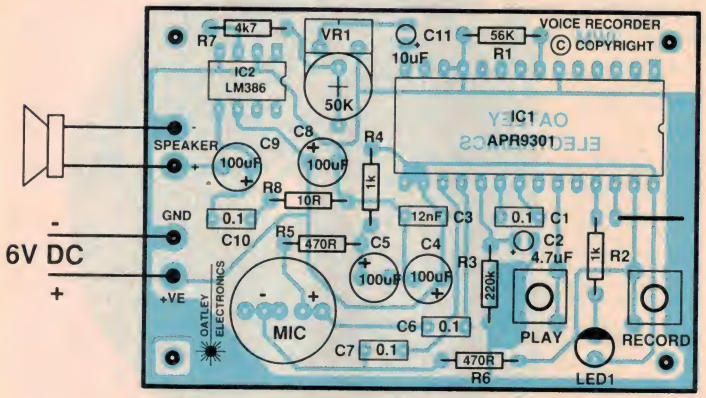
The playback output is from pin 14, which in this application connects to IC2 through the volume control (VR1). We found full volume caused distortion in the output, so we set the control initially to around half way. IC2, an LM386 audio power amplifier, is AC coupled to the speaker through C9. The RC network of C10 and R8 reduces the risk of oscillation at the output of the LM386, and capacitors C4 and C8 help filter out any modulation on the power supply rail.

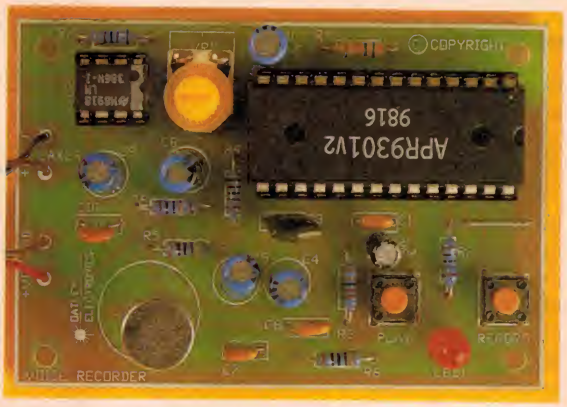
If you want to use an external audio amplifier, connect it across VR1 (pin 14 and earth), and set VR1 to minimum volume to prevent IC2 giving an output. By the way, to prevent acoustic feedback, IC1's internal playback amplifier is disabled during recording.

But perhaps the most important component in the circuit is R1. This resistor determines the sampling frequency, and for a recording duration of 20 seconds, the manufacturer recommends a value of 52k, giving a sampling frequency of 6.4kHz. We've used a 56k resistor, which gives a very slightly lower sampling frequency and longer recording time.



A block diagram showing what's inside the sound recording/playback IC type APR9301. As described in the text, audio can be recorded directly into the IC at pin 20.





To get a 30-second record time, increase R1 to 89k. This reduces the sampling frequency to 4kHz, with a corresponding reduction in sound quality. A value of 67k gives a sampling frequency of 5.3kHz and a recording time of 24 seconds. Incidentally, recording at one sampling frequency and playing back at another gives a sound like a cassette tape being played at the wrong speed...

The APR9301 IC is designed to operate at 5V, up to a maximum of 7V, and takes a standby current of 1uA. However the LM386 takes around 5mA (quiescent), so if an LM386 is used as the power amplifier, either power the unit from a mains-derived supply, or for battery operation, fit an on-off switch. Remember that a message remains stored in IC1 when the power is turned off.

Construction

As you can see in the photo, all components mount on a single PCB. Start by fitting the link and the IC sockets, followed by the resistors and capacitors, taking care with the polarity of the electrolytics.

Now fit the mic element and the LED, again making sure of the polarity of both of these components, then fit the two pushbuttons. Also connect the speaker and the battery holder (if it's being used). Finally plug the ICs into their sockets, making quite sure you've got them correctly orientated. That is, pin 1 is near the outside edge of the board.

Before testing, check over your work to make sure you haven't inadvertently introduced a short circuit between solder pads, and that all components are correctly soldered and positioned, and of the right value.

Testing

When you're sure the circuit construction is complete and correct, either power it from four AAA cells in a battery pack, or with an external 6V DC supply. Set VR1 halfway, and press the record pushbutton, which should cause the LED to light. If not, recheck your work, especially looking for soldering or component problems around IC1. Otherwise, record a message by speaking into the mic element. The record system is quite sensitive, so you don't need to shout or hold your mouth close to the microphone.

When the LED goes out, press the play pushbutton, and if all's well you should hear your message played back. If not, check if there's an output from pin 14 (with a scope or signal tracer). If so, the fault is probably associated with IC2. Otherwise check the recording section to make sure it's providing an input signal to IC1.

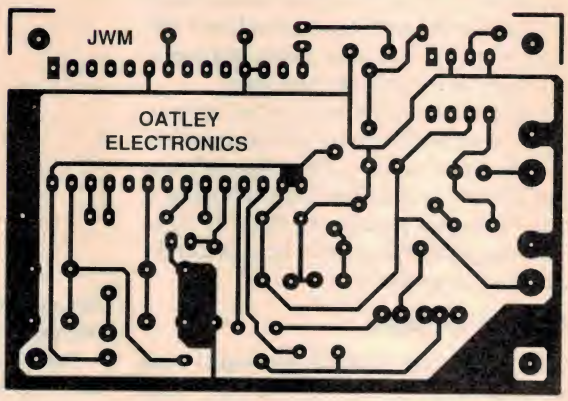
Finally...

Further work, such as housing the project depends on the application you might have for it. As already explained, if you are using the LM386 amplifier and powering the circuit from a battery, fit an on-off switch. Otherwise, power it from a 6V DC source with a current capability of around 100mA. Don't exceed the 7V maximum rating for IC1.

You might also experiment with the value of R1 to get the best combination of recording time and sound quality to suit your purpose. See under circuit details for information on the recommended range of values for R1. Otherwise, the rest is up to you and what you intend using this neat little project for. ❖

Above (left):The layout for the components. Use this diagram and the photo to help locate the components on the printed circuit board.
Above (right): Here's a close up of the board, to help you with component placement.

Here's the PCB pattern if you want to make your own. The artwork is copyright to Oatley Electronics, who will be the only commercial supplier of boards.



PARTS LIST

Resistors (all 1/4W)

R1	56k*
R2,4	1k
R3	220k
R5,6	470Ω
R7	4.7k
R8	10Ω
VR1	50k PCB mount pot

Capacitors

C1,6,7,9,10	0.1uF monolithic
C2	4.7uF, 16V electrolytic
C3	12nF ceramic
C4,5,8	100uF, 25V electrolytic
C11	10uF, 16V electrolytic

Semiconductors

IC1	APR9301 record/play IC
IC2	LM386 audio amp
LED1	3mm red LED
MIC	electret microphone module

Miscellaneous

PCB 50 x 72mm; 2 x PC mount pushbuttons; one each 8 pin and 28 pin IC sockets; 4Ω speaker; 4 x AAA battery holder; hook up wire.
* see text

Parts for this project are available from:
Oatley Electronics
Phone (02) 9584 3563
Postal address (mail orders):
PO Box 89, Oatley NSW 2223.
Kit of parts, $19
4 x AAA battery holder, 80c
Post and packing charges $5

Experimenting with Electronics

by Daren Yates, B.Sc.

Simple testing circuits

This month, we look at some simple circuits that will help you diagnose problems and fix them quickly.

I WAS ONCE TOLD that diagnosing a circuit problem was half the fun — and in a way it is. It's the best way to learn how circuits work.

While it's obviously more convenient having a circuit start up and work perfectly first go, a circuit that doesn't work certainly forces you to put your thinking cap on. Some of the best lessons I learned were from circuits that I had real trouble in getting to work...

Now that said, it's always good to have tools on hand that can limit the frustration level. Rather than trying out a new physical theory (such as the area of dispersement is proportional to the height from which a problem project is dropped!), there are some very simple but very useful pieces of test gear you can build that will make diagnosis that much easier.

Mind you, the trick is that you have to get *these* circuits to work first. Otherwise, you'll need test circuits for your test circuits... Err — yes!

Multimeter: a must

BEFORE WE get stuck into the circuits, we need to look at the tools you really *should* have already, otherwise they might be a waste of time at this stage.

Before you even think of building anything in electronics, you should have a multimeter. This is an electronic instrument designed to measure at least the three basic units of electronics: volts, amps and ohms.

There are two types of multimeter, known as analog and digital. The analog multimeter uses a moving-coil meter like the VU meters you would have seen on old cassette decks, whereas the digital units use a digital display such as you would see on any video recorder.

Digital multimeters are more convenient and usually have more options. They'll do things like measure the gain of transistors, and modern units can even measure capacitance for you.

Be that as it may, I actually think it's a good idea to have one of each.

An analog multimeter is better for measuring objects such as batteries, because the input impedance of an analog meter is generally much lower than that of a digital meter. The digital meter will give you more *precision* when measuring batteries, but unless it has a specific battery-measurement range, an analog meter will give a more accurate reading.

(Don't confuse the two terms — 'precision' and 'accuracy' are not the same thing. A digital multimeter might have the precision to give you a reading to three decimal places, but if it is only accurate to two, the last digit is really meaningless.)

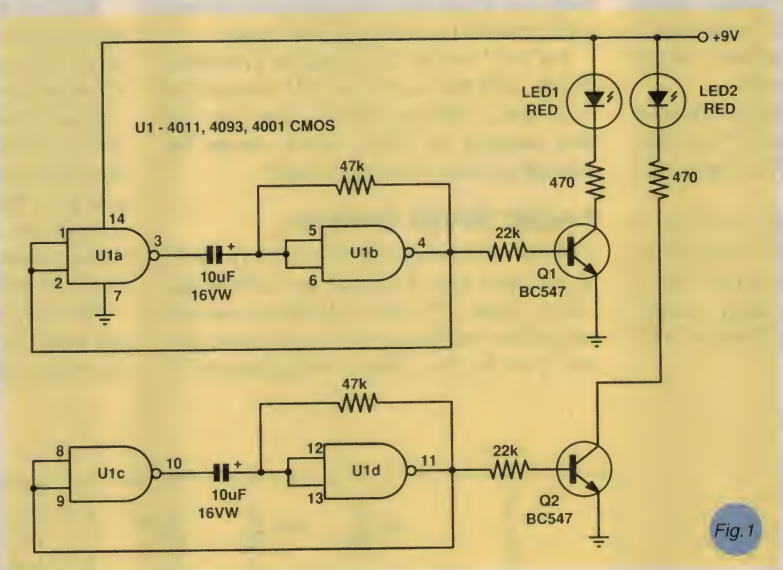


Fig.1

OK. Let's move on to some circuitry.

Simple 4011 tester

THE 4011 CMOS IC is such a useful little chip that it's not uncommon to find plenty of them lying around in the average junkbox. However, while they are pretty robust as far as CMOS chips go, it's also not uncommon to have one damaged gate within an IC after it's been given a thrashing on the test board. The thought is, "Well, three of them work at least — I'll hang on to it for a while longer..."

In fact, knowing that the chip is OK in the first place can save you hours later on if you're struggling to figure out what's wrong with your circuit and why it isn't working...

The beauty of this circuit is that it can also be used with 4001 and 4093 CMOS ICs.

The circuit itself is shown in Fig.1. It doesn't look like much — but it doesn't need to. The whole idea of a test circuit is that it should be simple enough to do the job and no more.

Looking at the circuit, it relies on the fact that the pin-outs of these ICs are identical; it simply connects both inputs of each gate together to create a series of inverters. These inverters are then automatically wired up as dual-inverter oscillators, and should start the LEDs flashing as soon as the power is switched on.

The circuit also relies on the fact that you can create inverters from any of these gates by simply joining their inputs together.

What it *can't* test is whether an individual input has gone open-circuit or just isn't mak-

ing a connection to anything; but it will at least give you a good idea of the overall condition of the chip. If one of the LEDs doesn't flash, then you know that either one or both of the gates associated with that LED are crook.

Fuse monitor

THIS NEXT circuit doesn't necessarily come under the guise of test equipment, but it's a handy one to build into your circuitry if you use fuses.

To be honest, most of the time this circuit doesn't work. It's not meant to. Only when the fuse blows should the LED light up — it will at least warn you that a major problem has occurred somewhere within the circuit proper.

The circuit is shown in Fig 2. As you can see there's very little to it. It's just a PNP transistor, a couple of resistors and an LED. When the fuse is OK and the current is flowing, there's virtually no voltage across the fuse. That means the PNP transistor is switched off, as its base and emitter voltages are pretty much one and the same.

However should the fuse blow, you now have voltage across it, so the PNP switches on and lights up the LED. It's simple, but works extremely well.

The important thing with this circuit is to make sure that you match the components with the supply voltage to the circuit. When that fuse blows, the whole supply voltage will come across the base and emitter as well as drive the LED...

As a rule, the Vce or collector-emitter voltage rating of the transistor should be at least equal to the supply voltage, but I'd recommend it to be at least 50% more.

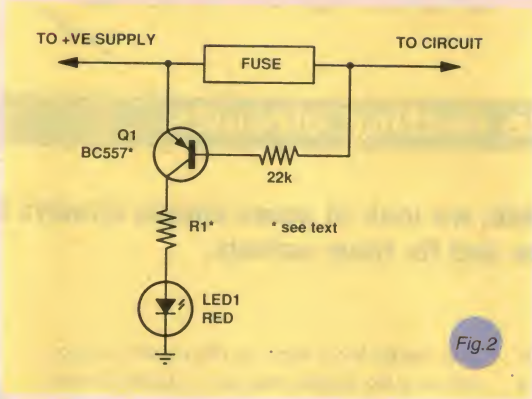


Fig.2

Since we've been talking about what really are low-voltage circuits up until now, I don't think you should have any problems with any of the standard small-signal PNP types.

For a 6V circuit, R1 should be 470 ohms; for 9V, 680 ohms; and for 15V it should be 1.2k ohms. This gives about 10mA of current through the LED, which should be enough to make it nice and bright.

Logic level tester

THIS IS A circuit that can come in very handy if you don't have a cathode ray oscilloscope (AKA 'scope' or 'CRO'). While you can use an ordinary multimeter to measure logic levels, it's a bit like using a sledgehammer to crack a walnut.

Multimeters aren't that great at showing a changing logic level, either — particularly if it's changing faster than the meter can handle.

This circuit has a fairly low-impedance input and can indicate switching levels as well.

The output is shown on one of four LEDs. The red LED indicates a high logic level, the green LED a low level. There are two yellow LEDs; one lit indicates a steady DC voltage in 'no-man's land' (between the two correct levels), while both lit indicates a pulse waveform.

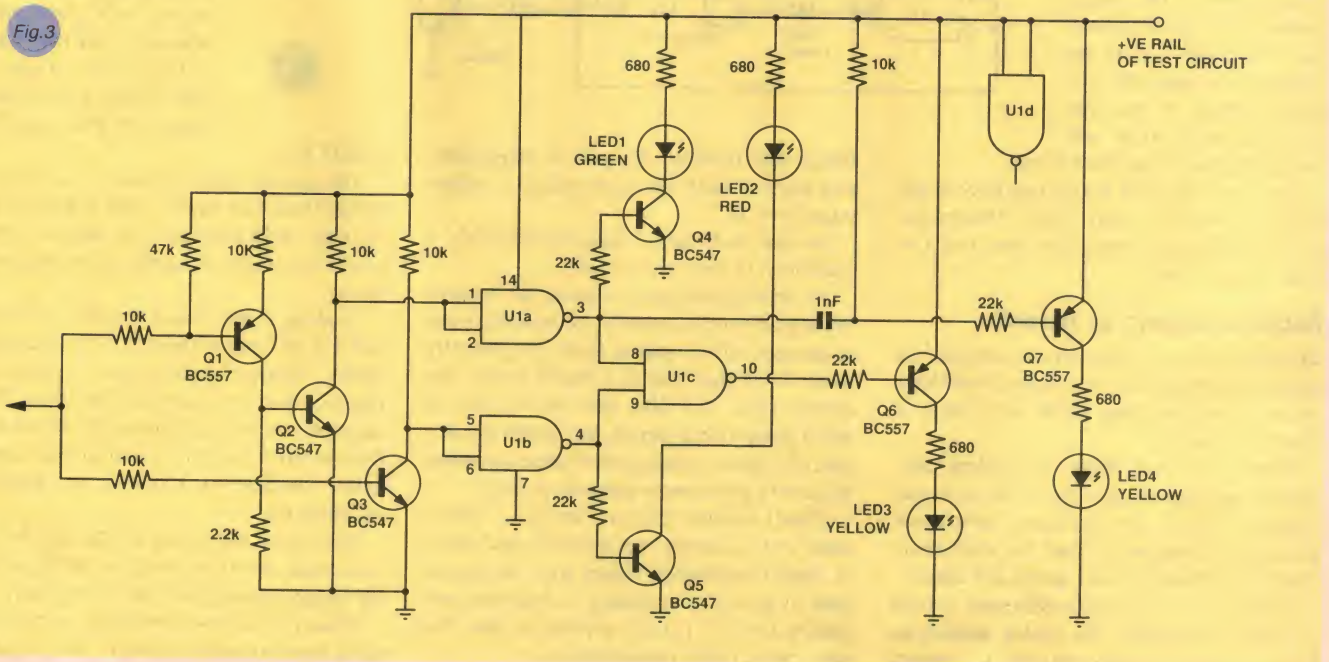
Looking at the circuit in Fig.3, the input (at far left) is connected to a three-transistor input stage. Really, this section just identifies what logic level the input signal is. If the logic level is high, transistor Q3 switches on. If it's low, then Q1 and Q2 switch on.

With no input signal, all three transistors are on due to the resistor biasing arrangement. This results in the collectors of Q2 and Q3 being low.

Both outputs are inverted by NAND gates U1a and U1b. The two inverted outputs are then also fed through into a third NAND-gate U1c. The result is that the output of U1c is only low when both inputs are high i.e., whenever the input is not connected to anything. So that's when LED3 lights up.

The only problem is that you'll also get this result if the logic level input is somewhere near half the supply voltage.

Fig.3



If the input signal is a stream of pulses, then transistor Q7 switches and lights LED4. Note that if the input is a steady DC voltage, LED4 remains off.

LED4 will only light up whilst the frequency is within the range of the gate. Once the input frequency rises above the response of the 4011 gates, the circuit will just 'give up' and LED4 will stay off.

Note too that the gates don't directly drive the LEDs. Even though these gates have buffered outputs, which means that they include an output stage inside, it's still not enough to really drive a LED. I certainly wouldn't like the gate to be doing this for any length of time and expect it to work for years.

Note that the unused gate has its inputs tied high and that the power supply should come from your problem project — as long as it's below 15V DC.

Signal injector/tracer

NOW THIS ONE can be a very handy circuit if you're building any type of audio amplifier. Where you'll find it of most use is when you've built your audio circuit on a printed circuit and you're getting no output signal.

Quite often, the problem will be a hair-crack in one of the PC board tracks — it may not be enough to see without a magnifying glass, but enough to stop the signal flow.

This circuit, shown in Fig.4, is really nothing more than a mini-audio amplifier that can be switched into an oscillator, which allows you to inject an audio signal into the circuit in question.

The way you use it is like this: if you're having trouble with an audio amplifier circuit, you switch it to 'inject' and feed the signal directly to the output to make sure that you first get a signal. This could be through a meter or speaker — some way that you can be definitely sure that the output is there.

Switching it to 'inject' simply adds some positive feedback to the amplifier so that it oscillates — that's all an oscillator is anyway.

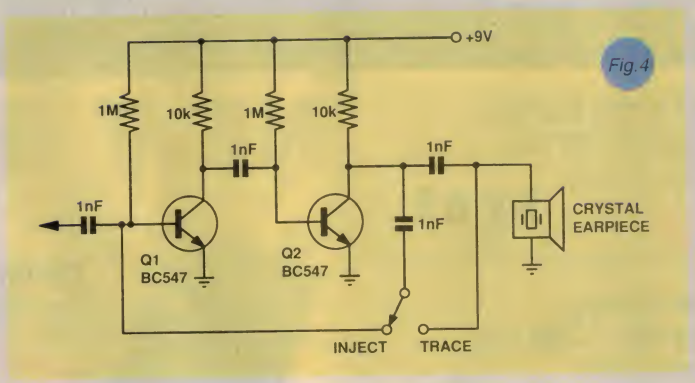


Fig.4

The only problem with the circuit as it is, is that with the crystal earpiece connected all of the time, you'll hear the tone. However, this can be a good feature to ensure the circuit is working and hasn't been loaded down by your problem project. Disconnecting the earpiece is easy though.

Next, you simply start working back through the signal path, one component at a time. If the circuit does have a fault, you should come to a point where there is no longer a signal at the output. Once that occurs, you then know that the problem is somewhere between that point and the previous test points.

When you know that, you can then check for things such as dud components or dry solder joints, or even cracks in the PC tracks.

Now the quality of the sound isn't superb, but it's good enough to get the job done. This circuit has plenty of scope of experimenting so have fun...

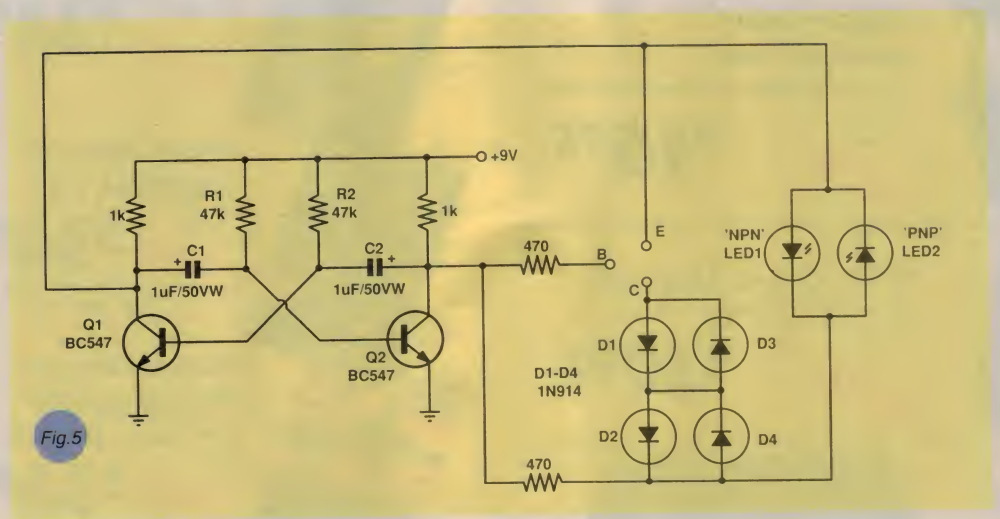


Fig.5

Transistor tester

THIS CIRCUIT is a simpler version of one that appeared in *Electronics Australia* way back some time in the late-70s. The original circuit used two 555 timer ICs to create two square waveforms out-of-phase.

This circuit does the same using just two transistors. Its job is to tell you whether a transistor is an NPN or PNP type, and whether it works or not.

Looking at Fig.5, the circuit is just a two-transistor oscillator with a couple of LEDs and a diode network.

All you do is connect up the test transistor and switch it on.

Let's assume the test transistor is an NPN type. If the collector of transistor Q2 is high, then Q1's collector is low. The base-emitter junction of the test transistor is forward biased and that shorts out LED2.

When the oscillator toggles state, i.e. Q1's collector is high and Q2's is low, the test transistor is biased off since it has no volts on its base pin; so the current flows through LED1 and it lights up.

Let's change the test transistor to a PNP type and start again, with Q1 on and Q2 off. The collector of Q2 is high and so is the base of the test transistor, and being a PNP type, it just isn't going to turn on at the moment. That allows current to flow through LED2.

When the oscillator toggles again, Q1's collector goes high and Q2's low; so we now have the test transistor's base-emitter junction being forward biased, shorting out the current flow through LED1.

So, LED1 lit indicates an NPN type and LED2 lit, a PNP.

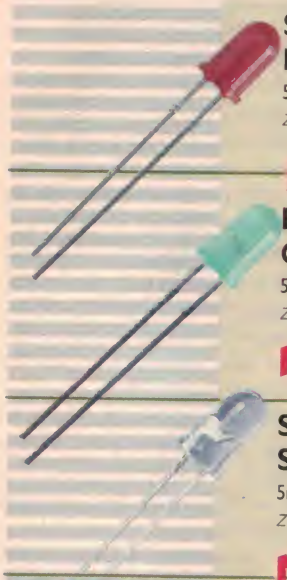
Diodes D1 to D4 ensure that reverse voltages don't damage the test transistor, short out its operation or affect the current flow.

These are all easy circuits to get going and you'll find them useful enough to build up on printed circuit boards and even as mini-projects. They'll also help your frustration levels when you get that circuit that just doesn't want to work...

OK. That's enough for this month. Next time, we'll take a look at some more circuits to experiment with. See you then! ❖

DICK SMITH ELECTRONICS

Where do you go all new books and electronics ?



Super bright flashing Red LED 3-15V DC
5mm, 280mcd at 3V DC.
Z 4044
NEW **$1.65**

Bright flashing Green LED 3-15V DC
5mm, 69mcd at 3V DC.
Z 4046
NEW **$1.65**

Super intensity Sunset Red LED
5mm, 8000mcd at 2V DC.
Z 4031
NEW **$2.95**

RB Electrolytics 100 pack
Includes PCB mounting RB capacitors.
R 7037
NEW **$14.95**

Lighter socket extension lead
2-piece DC adaptor with 4-metre cord. 12V DC.
P 1683
NEW **$16.95**

Red rotary warning light
Screw mounting, 12V DC warning light.
L 6005
NEW **$39.95**

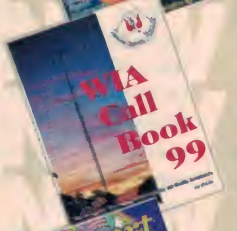
24V AC 1.5A adaptor
M 9635
$39.95

24V DC 1.5A adaptor
M 9636
$49.95 NEW

NEW BOOKS NEW BOOKS

Op Amps EA
Bryan Maher
B 3623
NEW **$5.95**

Basic Electronics EA
Peter Phillips
B 3621
NEW **$5.95**



WIA Amateur Callbook 1999
Wireless Institute Australia.
B 2343
NEW **$16**

Passport Wideband Radio 1999
B 2060
NEW **$34.95**

World Radio TV Handbook 1999
B 2099
NEW **$34.95**
Actual book cover may differ from image shown

Scanner Fanatics Frequency 1999
Radio scanner national listing.
B 4212
NEW **$36.95**

ARRL HAM Radio Handbook 1999 76th Edition.
1,200 pages.
B 2236
NEW **$59.95**

DICK SMITH ELECTRONICS
That's where you go!

Where do you go for great new kits this year ?

DICK SMITH ELECTRONICS

Thermocouple adaptor

- Can be used with any digital multimeter
- Temperature range governed by probe characteristics
- Range of probe supplied: -4°C to 250°C
- Connects to your digital multimeter via flying leads and banana sockets
- Operates on 1 x AA, 1.5V DC and 1 x 9V DC battery
- Comes with case, front panel label, battery clips, PCB and all components

SILICON CHIP Dec '98

K 7120

$34.95 NEW

Actual product may differ from image shown

Engine immobiliser Mk II

- Circuit stalls engine when activated
- Connects directly to ignition system
- Kit can be assembled and used independently
- Can also be interfaced with control module (keypad) to be released shortly
- Power supply: 12V DC
- Includes all components, case and PCB

K 4303

$29.95 NEW

SILICON CHIP Dec '98

Immobiliser Mk II Keypad

- Interfaces with the new Immobiliser kit
- Choose your own 4 digit code for arming/disarming
- No hidden switches required or keys to carry
- Can be hidden or mounted for visible deterrence
- Power supply: 12V DC
- Supplied with hardware, keypad module, PCB and all components

K 4304

$32.95 NEW

Actual product may differ from image shown

SILICON CHIP Jan '99

12V Car Ammeter

- Circuit measures voltage drop across negative strap
- 10 LEDs to indicate level or charge or discharge
- Displays levels between -25A and 25A on 12V
- Use to monitor the state of charge of the battery to control accessory loads, etc.
- Power supply: 12V DC
- Includes all components, case and PCB

K 4612

$16.95 NEW

SILICON CHIP Jan '99

Screecher Car Alarm Mk II

- Utilises a high-output, compact piezo siren to blast an intruder inside your car
- Compact, easy to install and extremely effective
- Features entry/exit delays, flashing warning LED
- Circuit includes transition sensitive triggers
- Power supply: 12V DC
- Includes all components, piezo siren, case and PCB

K 4301

$29.95

EA Jan '99

NEW

Stamp-based universal timer

- Timer circuit that utilises the features of the Stamp microcontroller
- Features LEDs, and piezo buzzer to indicate events
- Multiple inputs for design flexibility
- Includes relay, components, and multi-purpose PCB
- Power supply: 12V DC
- K 1408

$18.95 NEW

Stamp microcontroller not included

SILICON CHIP Jan '99

COMPARE OUR 1998 CATALOGUE PRICES TO THESE HOT DEALS!

CAT NO	DESCRIPTION	ARTICLE	SELL
K 5582	KIT 500 WATT AMP	SC 8/97	$649
K 5570	KIT PRO SERIES 3 AMP	EA 2/94	$399
K 5590	KIT 50 WATT STEREO AMP	EA 7/96	$229
K 5555	KIT STEREO PRE-AMP	EA 1/97	$159
K 5416	KIT AV-CAM	EA 8/97	$149
K 5990	KIT TV STEREO DECODER	EA 1/95	$149
K 2695	KIT FUNWAY 2 JUMBO GIFT BOX		$145
K 7343	KIT RF TEST OSCILLATOR	EA 5/96	$99
K 5415	KIT VIDEO FADER WIPER	EA 4/98	$59.95

CAT NO	DESCRIPTION	ARTICLE	SELL
K 6007	KIT 3 BAND AMATEUR RX	SC 9/96	$59
K 7348	KIT FUNCTION GENERATOR	EA 3/97	$69
K 3607	KIT LINE CARRIER	EA 11/97	$59.95
K 3010	KIT LOGIC TRAINER	SC 2/96	$59
K 3258	KIT UHF REMOTE SWITCH	SC 12/89	$39.95
K 3606	KIT PHONE/MODEM SWITCH	EA 6/97	$39.95
K 5102	KIT STROBOSCOPIC TUNER	EA 5/96	$34
K 3302	KIT HIGH ENERGY IGNITION	SC 8/97	$29.95

See our stores for more great bargains on discontinued kits!

direct link

Direct Link is equipped with the service centre to supply you with a hassle free delivery direct to your door. PHONE 1300 366 644 to reserve your order

Availability: Our kits consist of many different parts from numerous suppliers. Whilst we have consulted closely with them and are satisfied as to their ability to supply, sometimes problems can arise in obtaining all of the parts. This means there is a slight chance that availability may be delayed. Rainchecks are available, however if you'd like to check beforehand, please don't hesitate to contact your local store.

DICK SMITH ELECTRONICS

That's where you go!

DICK SMITH ELECTRONICS

Where do you go for the best electronics selection?

Line Fuseholder 10A

Compact, fast connecting fuseholder. 250V AC, 10 Amp rating.

P 9962

$2.95

Cigarette lighter plug 2A

Special light-duty version. With built-in fuseholder for easy fuse replacement.

P 9861

$2.95

60mm desk grommets

H 1730 Round (black)
H 1731 Round (almond)

$5.95

Un-Du label remover 30ml

Removes adhesive labels and retains sticker adhesiveness. Includes spade to lift stickers. Evaporates rapidly. Non-staining remover.

N 1204

$9.95

Keypad engine immobiliser

This one circuit (30 Amp relay) immobiliser can protect your car even if the keys have been left in the ignition. Features auto arming 15 seconds after ignition shut off, flashing LED, backlit keypad and a preset 4 digit security code.

L 5455

$29.50

101-pc bit set with carry case

Includes driver handle and magnetised bit holder. Features flat blade, Phillips, square, security Torx, Tri-wing, spanner, torque bits and more.

T 4513

$36.80

Auto headlight minder

Headlight minder automatically turns your car headlights on at night or in stormy conditions using a light sensor. Connects to ignition and light switch.

L 5475

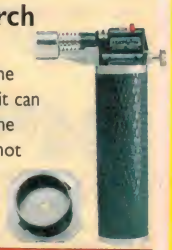
$39.95

Electronic ignition torch

Butane powered with simple push-to-start electronic ignition. The flame is fully adjustable, and the unit can either be hand-held or placed on the benchtop in its stand. (Butane gas not included)

T 1390

$49.95



SAVE ON SUPER BRIGHT LEDs

5mm Yellow, 5000mcd

Z 4009

SAVE 75¢ **$2.50**

5mm Red, 3600mcd

Z 4074

SAVE 35¢ **95¢**

BOX CLEARANCE SALE!

50% OFF!*

HOT PRICES ON ALL BOXES LISTED BELOW!

Hurry in for best value boxes to suit your every project requirement.

Not all models available in all stores

Aluminium boxes

Economical and easy to work with! A wide range of sizes to suit just about any project. Made in two sections, they come complete with screws.

104 x 70 x 51mm (LWH)
H 2300 **$4.95**

133 x 76 x 54mm (LWH)
H 2325 **$5.25**

StorPak 63 with drawers

Three-draw stackable storage unit.

H 2590 **$11.25**

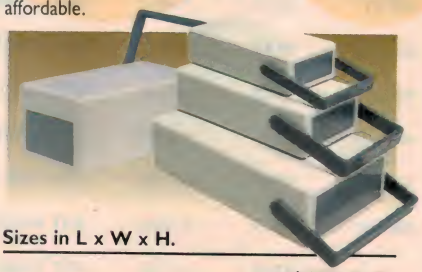
Modular parts draw

Divided into two convenient segments.

H 2580 **$2.45**

Hobby boxes with handles

Convenient, solid boxes at such great prices! Choose a size that suits you at a price that is truly affordable.



Sizes in L x W x H.		
131 x 67 x 34mm	*H 2846*	**$7.45**
131 x 67 x 57mm	*H 2847*	**$7.95**
160 x 80 x 44mm	*H 2848*	**$8.95**
197 x 110 x 56mm	*H 2849*	**$9.95**

** Prices listed already include 50% discount*

Easy mount box

Perfect for automotive applications, the base of this project box has flanges that allow easy fastening to flat surfaces. With ABS plastic casing and aluminium base. Size: 145 x 85 x 50mm.

H 2894 **$6.45**

Handheld case

With battery compartment, tilting stand and solid display area that can be cut out if required.
The size is 180 x 100 x 40mm.

H 2952 **$8.08**

Steel enclosure cases

High-quality cases that pack flat for easy-to-modify aluminium front and rear panels.

431.8 x 63.5 x 177.8mm
H 3104 **$9.75**

203.2 x 132.0 x 279.4mm
H 3112 **$13.45**

304.8 x 132.0 x 279.4mm
H 3114 **$16.25**

DICK SMITH ELECTRONICS
That's where you go!

Where do you go for amazing meter savings?

DICK SMITH ELECTRONICS

17-range multimeter

With 3.5 digit (2000 count) LCD. Features 20A current range, diode and continuity test, auto polarity and low battery indicator. Transistor test. Includes 10M ohm input impedance (DCV).

Q 1443

$34.90

SAVE $15

LCD panel meter

3.5-Digit LCD Panel Meter. With 'full scale' of 200mV or 2V (user selectable) and a high input impedance (100M ohms). It can be self mounted and includes a mounting bezel. Comes with a comprehensive data sheet.

Q 2200

$39.50

SAVE $20

Sound level meter

Handy for measuring the noise level of traffic, factories, machinery and aircraft noise. Portable with two sound ranges from 40-80dB and 80-120dB. Includes carry case and instructions.

Q 1360

$99

SAVE $40

Deluxe dual input thermometer

Compact, handheld dual input digital thermometer with 4.5 digit LCD. Offers both Celsius and Fahrenheit readings. Beeper sounds when preset temperature limits exceeded. Records minimum/maximum temperatures and time. Relative mode displays difference between reading and preset value.

Unit Range:
-200° to 1,370°C.
Thermocouple Range:
-40° to 260°C.

Q 1437

$99

SAVE $70

Professional clamp meter

- 3.5 Digit 2000 count LCD
- AC current : 10mA - 700A
- DC Volt : 1V - 600V
- AC Volt : 0.01V - 600V
- Resistance : 1ohm - 200Kohm
- Frequency : 10Hz - 20KHz
- 600V overload protection with diode and continuity test.

Q 1475

$149

SAVE $20

60MHz Dual Trace Dual Timebase CRO

A top performing oscilloscope with features that will handle engineering, technical and design applications. Features dual timebase for more accurate timing measurements and for comparing portions of a signal at 2 different sweep speeds. Comes complete with 2 probes.

Features: • 60MHz bandwith • beam finder • Y output • Z modulation • variable hold off • trace rotation • AC,TV-H and TV-V trigger coupling • 10ns/DIV-1s/DIV variable sweep rate • fully adjustable sensitivity • component tester • fully adjustable sweep time • complete with 2 probes

Q 1806

SAVE $200

$995

This magazine is now on sale at all our New Zealand stores!

direct link

PHONE, FAX & MAIL ORDERS

PHONE: 1300 366 644 (Local Call Charge) **FAX:** (02) 9395 1155
MAIL: **DICK SMITH ELECTRONICS,** Direct Link Reply Paid 160, PO Box 321, North Ryde NSW 1670 (No Stamp Required)

Please add postage (up to 5kg) to your order, as follows:
• $4.00 ($1 Up To $50) • $7.50 ($51 Up To $100) • $9.00 ($101 Up To $500) • $11.00 (over $500)
(quote available for air/road freight or if over 5kg) email: directlink@dse.com.au (enquiries only)

•Major Credit Cards Accepted. • Gift Vouchers Available

Not available at all authorised stockists.

NEW STORES AND RELOCATIONS

ACT	Fyshwick	Cnr. Townsville/Albany Sts	6293 3399
NSW	Penrith	PowerHouse, cnr Batt & Mulgoa Rds	4721 1544
NSW	Rockdale	Shp M2 Rockdale Plaza, Princess Hwy	9588 9309
VIC	Altona Gate	Altona Gate S/C Millers Rd	9314 6611
	Carnegie	PowerHouse, 1048-1054 Dandenong Rd	9569 2644
	Greensborough	Shop 2, 16-22 Main St	9432 5125
WA	Mandurah	Unit 1, 318 Pinjarra Road	9586 9666

B 3618

DICK SMITH ELECTRONICS
That's where you go!

Construction Project

Receiver for the VNG Clock - 1

Designed to mate with the author's VNG Radio Clock featured in the March 1998 issue, this five-frequency receiver is specifically intended to pick up the time signals broadcast by Radio VNG. The receiver is easy to build and get going. Construction should be within reach of anyone with a moderate amount of project building experience.

by Peter Stuart, B.E., VK2BEU

THESE DAYS people don't tend to think of building their own radio gear. Perhaps this is because commercial gear is more attractive (although not necessarily reasonably priced). Or perhaps it's because there appears to be no purpose in building a simple HF receiver.

If you are in this latter category, then here's the impetus you needed to have a go. You built the clock, so why not build your own matching receiver? It certainly has a real purpose.

Building your own radio equipment has never been easier, thanks to modern communications IC's. Building a receiver to pick up VNG is a breeze because only simple circuitry is required, thanks to the AM (amplitude modulation) mode of transmission. VNG also transmits its signals at quite high power, resulting in strong signals in most areas. The relatively low shortwave frequencies also mean that no fancy circuit techniques are required.

The circuit described here is a superhet design, based on a shortwave receiver which appeared in these pages in January 1985. This circuit differs from the original in that it does not provide continuous tuning. Instead, tuning is accomplished by stepping from one VNG frequency to another. All five of VNG's frequencies can be tuned in.

Despite its simplicity, the VNG-5 is right up to date in its circuitry. It features varicap diode tuning; toroidal cores for the inductors, and the aforementioned frequency stepping system using CMOS logic and two pushbutton switches. Although it is really a two-band radio, the band switching is done automatically by relays so that the operator is unaware of the switching of the coils.

The RF and audio stages use only three active components: two ICs and a FET. CMOS devices are used for the digital frequency selection. A signal strength meter is also included.

Designed specifically for receiving the signals from VNG, the receiver is quite compact. The signal strength meter allows easy fine-tune peaking on any of the five channels.

The receiver is quite a good performer, when a long-wire antenna is connected. I use a 20-metre long wire, and on most evenings when the local VNG signal on 5MHz fades out, I can pick up the American WWV station in Colorado, which shares the frequency.

While its performance cannot really be compared with that of a modern communications receiver, the choice of five frequencies means that at any time of day, there is usually one which is coming in strongly enough to meet the clock's requirements. The receiver is also very stable after a three minute warmup period.

In keeping with its purpose as a signal source for the clock, rather than an entertainment source, the number of operator controls has been kept to a minimum. The front panel contains two buttons for up/down tuning, a Fine Tune control and a Volume pot. Five LEDs indicate which frequency is currently selected.

Below each LED is a small hole through which a screwdriver can be inserted, should occasional retuning of any frequencies be required.

Circuit description

Most of the RF circuitry is contained within the TEA5550 'Radio Circuit', as the Phillips data sheet describes it. This IC has been used in car radio applications for many years.

The TEA5550 contains an RF amplifier, a local oscillator, an IF amplifier, a detector and a low power audio stage. It also has an AGC stage and a built-in voltage regulator. With just a handful of external components connected to this 16-pin IC, you can build a very stable, sensitive, AM superhet tuner.

In this application sensitivity is further boosted by a separate RF amplifier using a BFR84 dual gate FET. The amplified signal from the FET is tuned by either L1 or L2 and a BB212 varicap diode, before being sent to pin 1 of the TEA5550. Relay RLY1 determines which of the two coils is in circuit.

The local oscillator is a replica of the RF tuning stage using coils L3 and L4 and another BB212 varicap diode. Relay RLY2 selects the appropriate coil. The local oscillator is connected to pin 15 of the IC. For stability, both the RF and local oscillator stages

are powered from an 8.5V regulated supply.

Although this is a superhet design, the tuning system is a little unusual because continuous tuning is not required. Both the RF and LO stages are tuned by the voltage applied to their respective varicap diodes. But whereas the same voltage would normally be applied to both varicap diodes to tune both stages together, in this design, separate pots are used for the two stages.

We thus end up with five pots for the RF stage and five pots for the local oscillator. This was done to allow optimising of the two voltages, and hence the tuning, at each of the five spot frequencies. Trying to optimise the tuning of a conventional superhet across its band is usually a compromise.

Tuning of the RF stage is carried out by single-turn trimpots, while tuning of the local oscillator stage is done with 10-turn trimpots. The latter have fixed resistors either side of them to restrict the tuning to about 10% of the available range.

The difference in the two types of pot comes about because a superhet circuit is actually tuned by its local oscillator, and hence precision and fine resolution are required to tune it in. On the other hand the tuning of the RF stage can be reasonably coarse.

The Fine Tune pot is used is used to peak the tuning of each frequency when it is selected.

Returning to the components around the TEA5550, the IF stage consists of a tuned ceramic filter and a conventional IF transformer connected between pins 6 and 3. The intermediate frequency is 455kHz and the local oscillator frequency is higher than the tuned frequency by this amount, on all five received frequencies.

Audio amplification is carried out by an LM386 amplifier which drives a small speaker. In keeping with commercial practice, the speaker is muted when an external speaker is plugged into the socket.

Pin 14 on the TEA5550 is the AGC voltage output and this provides a convenient source to power a signal strength meter. The trimpot in series with the meter gives a range adjustment. If this feature is not required, connect only the capacitor to pin 14.

The tuning system uses a 4516 up/down counter, which is limited to counting in the range 0 to 4. The counter is incremented or decremented by either of two switches, connected to a 4071 quad OR gate.

The 4071 has the job of debouncing the closure of the switches, and squaring up and differentiating the closures to produce brief 0.1ms-wide pulses to pins 8 and 9 of the third OR gate. This latter gate ORs together the switch pulses.

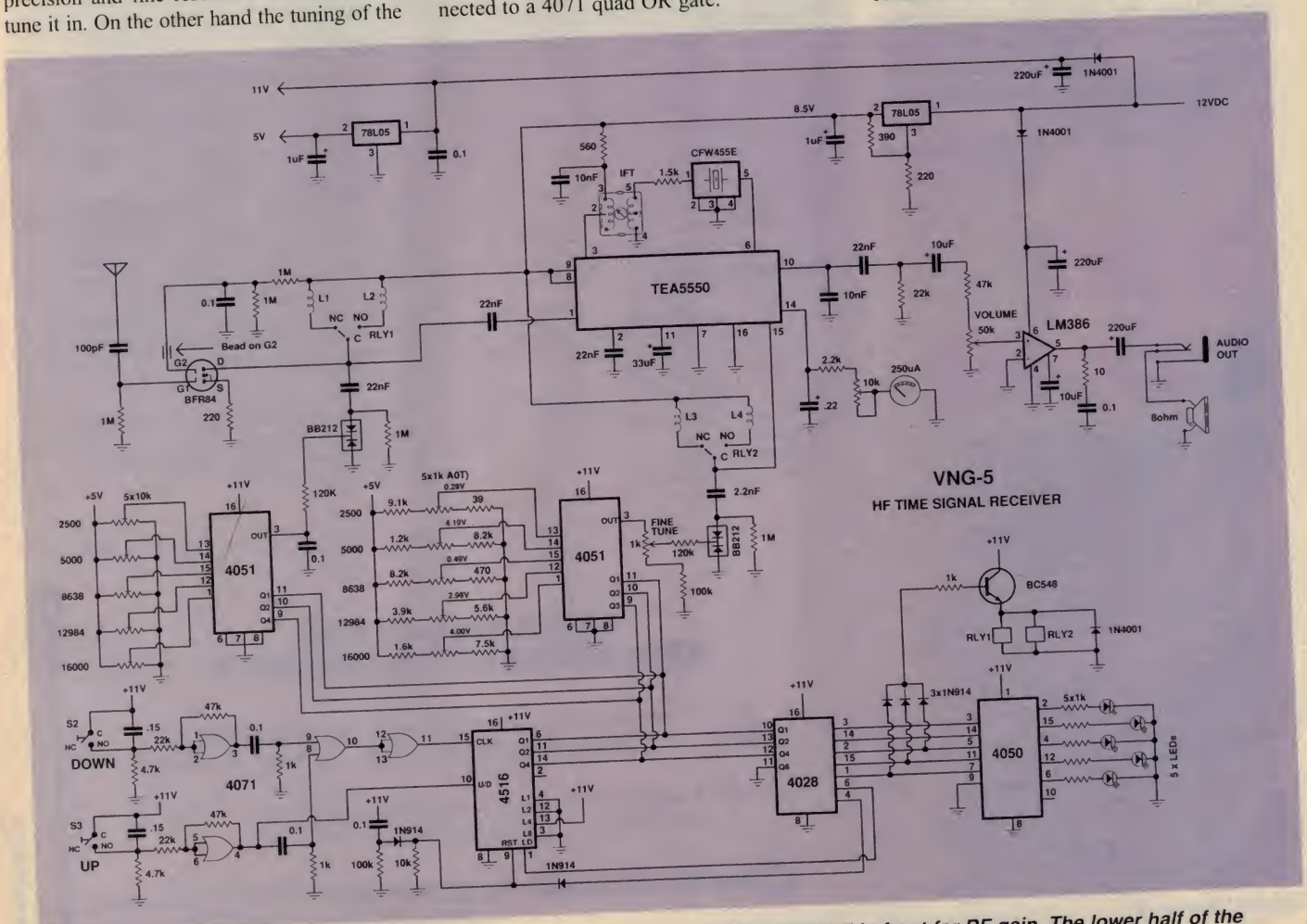
The fourth gate adds nothing in a logic sense, but it does introduce a slight propagation delay to the signal before it passes to pin 15, the clock input to the counter.

Propagation delays within the OR gates ensure that the pulses are delayed slightly with respect to the Up/Down control line going to pin 10 of the counter. Pin 10 must be at 5V for up-counting and at ground for down-counting, before the leading edge of the 0.1ms pulse arrives at pin 15.

The three least significant binary output pins of the 4516 counter are connected to a 4028 1-of-10 decoder. In this application it is made to operate as a 1-of-8 decoder, by grounding pin 11.

The 4028 has two jobs: to decode the binary count and place it on the individual pin outputs; and to provide feedback to the counter to keep its count within the range 0-4.

Taking the latter function first, a decoded count of '5' will eventually appear on pin 6



At the heart of the circuit is a TEA5550 receiver chip, with a dual-gate BFR84 MOSFET in front for RF gain. The lower half of the circuit is largely for channel selection and tuning control.

of the 4028 during up-counting. This signal is fed back to the LOAD input (pin1) of the counter. Since the load inputs on pins 4, 12, 13 and 3 are permanently binary coded to logic '4' (0100), this value is loaded into the counter, replacing the '5' which the counter just reached. Thus the counter can never count up beyond a count of '4'.

A similar arrangement is used to prevent the counter from counting down below zero (which would produce a count of '7', since it is configured as a 3 bit counter). Pin 4 (the decoded '7' output) of the 4028 will go high whenever the count goes below zero during down counting. This pin is connected back to the reset pin (9) on the counter, through a diode, so that the counter cannot count below zero.

Another diode is also connected to the reset pin of the counter. The diode leads from a 100k resistor and 0.1uF capacitor, which remains briefly high during power up. This causes the counter to reset to zero. By this means, the receiver always defaults to the lowest frequency (2.5MHz) upon switching on.

The voltages determined by the settings of the pots are selected for the varicap diodes by two CMOS analog selector switches. CMOS 4051 devices are used because of their binary input selector pins. The 4516 counter applies the necessary binary code to the 4051s. Each 4051 places the selected pot's voltage on pin 3. This pin is connected to each of the varicap diodes through 120k resistors.

The decoded outputs on the 4028 are sent to a 4050 buffer which supplies the drive current to illuminate one of five LEDs on the front panel.

Diodes are also connected to the three highest decoded outputs of the 4028. The diodes are OR connected to energise the two band change relays through a BC548 transistor. The relays are energised whenever one of the three highest frequencies are selected.

The receiver will operate from a DC supply within the range 11-15 volts. Current draw is between 80mA and 100mA depending on whether the relays are energised. Battery operation is possible for short periods.

The incoming supply is split up into four different supplies. An unregulated supply goes to the audio stage. Another, isolated from the first by 1N4001 diodes, powers the CMOS logic circuits at 11V. An 8.5V regulated supply using a 78L05 regulator runs the TEA5550. I found the inbuilt regulator on pin 9 varied its output with varying supply voltage, and this upset the tuning.

Lastly, a 5V regulated supply using another 78L05 regulator ensures stability for the tuning pots.

Construction, testing and alignment of the receiver will be described in the second of these articles.

(To be Continued) ❖

PARTS LIST

Resistors

All 1% 1/4W: 1 x 39Ω; 1 x 220Ω; 1 x 390Ω; 1 x 470Ω; 1 x 1.2k; 1 x 1.6k; 1 x 3.9k; 1 x 5.6k; 1 x 7.5k; 2 x 8.2k; 1 x 9.1k.
All 5% 1/4W: 1 x 10Ω; 1 x 220Ω; 1 x 560Ω; 8 x 1k; 1 x 1.5k; 1 x 2.2k; 2 x 4.7k; 1 x 10k; 3 x 22k; 3 x 47k; 2 x 100k; 2 x 120k; 5 x 1M.
1 x 1k linear pot 16mm
1 x 50k linear pot 16mm
6 x 10k horizontal trimpots
5 x 1k 10-turn trimpots

Capacitors

1 x 100pF ceramic
11 x 0.1uF ceramic
1 x 2.2nF greencap
2 x 10nF greencaps
4 x 22nF greencaps
2 x 0.15uF MKTs
1 x 0.22uF tantalum
2 x 1uF/35V tantalums
2 x 10uF/16V electrolytics
1 x 33uF/16V electrolyitc
3 x 220uF/16V electrolytics

Semiconductors

1 x TEA5550 AM radio IC*
1 x LM386 audio amplifier
1 x 4071 CMOS quad OR gate
1 x 4028 CMOS 1-of-10 decoder
1 x 4050 CMOS hex buffer
2 x 4051 CMOS 1-of-8 analog switches
1 x 4516 CMOS hex counter
1 x BFR84 FET
1 x BC548 transistor
2 x BB212 varicap diodes
5 x 1N914 diodes
3 x 1N4001 diodes
2 x 78L05 5V regulators
5 x LEDs 3mm

Miscellaneous

1 x metal case 160 x 185 x 70mm
1 x PCB 132 x 117mm, coded 01vngr1a
1 x PCB 61 x 23mm, coded 01vngr1b
2 x Amidon toroids FT68-6**
2 x Amidon toroids FT37-6**
1 x Amidon bead FB43-101**
2 x Relays SPDT 12V (DSE P8007)
1 x Murata 455kHz ceramic filter (DSE R5050)
1 x IF/osc coil kit (DSE R5040 or Jaycar LF1050)
2 x Pushbutton switches (click action; eg Jaycar SP0714)
1 x Panel meter 250uA (option; DSE Q2100)
1 x 8Ω speaker 57mm
1 x Toggle switch SPDT; 6 x 16-pin IC sockets; 1 x 14-pin IC socket; 1 x 8-pin IC socket; 1 x phone socket 3.5mm; 1 x UHF antenna socket; 10 x LED holders 3mm; 2 x knobs, 16mm; 4 x spacers 10mm x 3mm thread; 16 x PCB pins 1mm; 1 x 6-way pin header; 1 x 6-way crimp header socket; Enamelled copper wire 0.5mm x 3m; hookup wire; aluminium rod 6mm x 350mm; 3mm screws, nuts, washers, solder.

*Available from WES Components, Ashfield, NSW; (02) 9797 9866.
** Available from suppliers listed under 'Amidon' in MarketPlace.

Notes & Errata

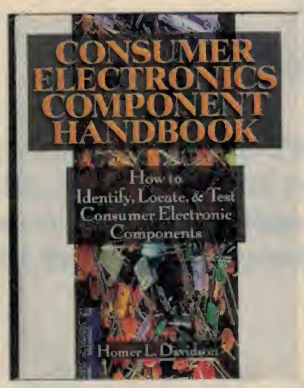
Avision ScanCopier (November 1998): When the review of this product was prepared for publication, we had been advised that it would be available from Innovision Group at the price quoted. However we have now learned that this company is no longer handling the ScanCopier, which is instead available from distributor Star Micronics; phone (02) 9748 4300 in Sydney or (03) 9579 4600 in Melbourne. The price now also appears to be significantly higher than the figure we were quoted. We apologise to readers for this inadvertent misinformation.

EPROM Programmer (Sep/Oct 1993): *EA* reader Gary Hart has come up with a number of modifications that allow the programmer to support 27512, 27010 and 27020 EPROMS. While the mods are a bit too lengthy to print here, they are available from our website as the file EPROMMOD.TXT in the Recent Notes and Errata file area. ❖

New Books

Servicing guide

CONSUMER ELECTRONICS COMPONENT HANDBOOK, by Homer L. Davidson. Tab/McGraw-Hill, 1998. Hard covers, 243 x 193mm, 437 pages. ISBN 0-07-015807-X. RRP $141.95.



Another book from prolific US electronics author Homer Davidson. This one is essentially for trainee service techs, or anyone wanting to get into the practicalities of day-to-day troubleshooting and repair. As the subtitle says on the front cover, it's designed to show you 'How to Identify, Locate, & Test Consumer Electronic Components'.

The approach Mr Davidson takes is a bit like an encyclopedia, with each kind of component covered alphabetically for easy reference. Within each section there are further subdivisions, generally headed 'What' (giving a description of the component's function and construction); 'Where' (its usual location, and in what equipment); 'When' (the kinds of fault it can develop, and the typical symptoms); and finally 'Testing', describing the ways it can be tested.

The writing style is quite friendly and accessible, as we've come to expect from Mr Davidson, and despite the fact that it's written from a US viewpoint there's still a lot of sound and practical technical information that's just as applicable here.

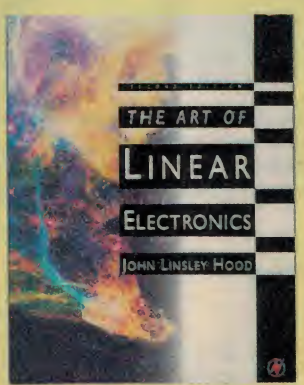
All the same, there are a surprising number of examples of poor editing of the text, and what look suspiciously like missing, wrong or duplicated illustrations. For example the section on RF chokes (pp 74-75) says Fig.3-16 shows testing an RF choke, while the figure itself clearly shows testing an iron-cored filter choke with a high value electrolytic on each side. And in the text dealing with bulbs, I found the sentence 'Neon bulbs operate from LEDs at a higher voltage than the incandescent or LED bulbs' — huh?

In short, there's evidence of too-hasty writing, sloppy editing and/or inadequate proofreading. Pretty disappointing, in a book that's quite expensive and otherwise very worthwhile. For this kind of money you'd also expect colour half-tone illustrations, not B&W pics that are often dark and dingy.

The review copy came from McGraw-Hill Australia, PO Box 239, Roseville 2069. (J.R.)

Linear design classic, Mk2

THE ART OF LINEAR ELECTRONICS, Second Edition, by John Linsley Hood. Butterworth-Heinemann, 1998. Soft covers, 246 x 190mm, 348 pages. ISBN 0-7506-3746-3. RRP $75.00.



The second edition of this excellent book by well-known and highly respected British audio amplifier designer John Linsley Hood. Almost as soon as the first edition appeared in 1993 it became an 'instant classic' reference in audio design circles, and its value can only be increased with this updated and revised edition.

With the digital revolution, linear analog design somehow seems to have become the 'cinderella' area in electronics, receiving little emphasis in college and uni courses. Books like this are therefore going to be increasingly important if good analog design isn't to quietly sink into obscurity.

Not a great deal seems to have changed with this edition, but then very little needed to be changed. It's still a well written and logically presented introduction to and exposition of basic linear analog electronics, slanted towards practical design and with a strong emphasis on understanding the physical behaviour of components and circuits. There aren't huge slabs of maths, and very few photographs; but on the other hand a great many diagrams, circuits and graphs to illustrate the concepts discussed.

The production values are perhaps a little less glossy than you'd get in the average American book, and some of the diagrams are a little too small for easy reading. But the high standard of Mr Hood's treatment overcomes these minor hurdles, and there's no doubt that the book deserves a place on every analog circuit designer's reference bookshelf. The review copy came from Butterworth-Heinemann Australia, PO Box 251, Port Melbourne 3207. (J.R.)

PCB design

PRINTED CIRCUIT BOARD DESIGN USING AUTOCAD, by Chris Schroeder. Published by Butterworth-Heinemann, 1998. Soft cover, 178 x 234mm, 316 pages. ISBN 0-7506-9834-9. RRP $90.

AutoCAD first hit the market in 1982, and is reputed to have put the IBM computer into industry. It is perhaps one of, if not the best known industrial design programs. Being so powerful, it's not an easy program to use, but once mastered, it seems it can do almost anything — including quite specialised tasks.

This book is mainly a series of exercises that show how to draft electronic schematics and design single-sided, double-sided and surface mount PCBs using AutoCAD. It also covers preparing detailed fabrication and assembly drawings for PCBs designed on other EDA systems. It includes appendices on the Gerber and Excellon formats, and starts with an overview of PCB manufacturing technology and design techniques.

The book comes with a copy of AutoPADs, a proprietary toolkit for PCB designers using AutoCAD. The disk includes the AutoPADs conversion utilities, sample files for the exercises in the book, and AutoCAD libraries for schematics and PCB design. The utilities allow bidirectional transfer of Gerber format photoplotter data and Excellon format numerical control (NC) drill data from AutoCAD. They also support input of HPGL data from other CAD systems.

The book is well illustrated and is easy to read. The review copy came from Butterworth-Heinemann, PO Box 146, Port Melbourne 3207. (P.P.) ❖

$10 Wonders

19 — Quiz Timer

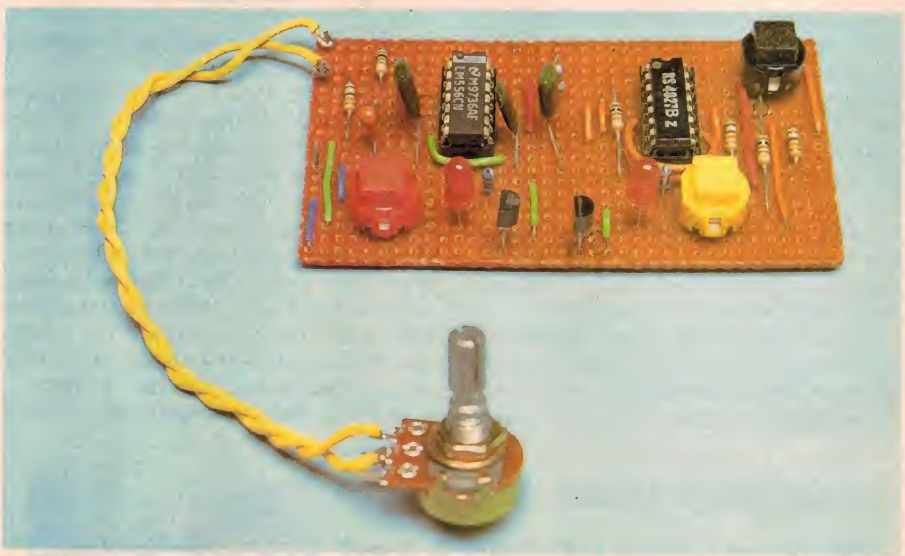
Who was first? It's an age-old question, but with the help of this circuit you'll be able to get an impartial and split-second verdict. Whether it's a test of physical or mental agility, the Quiz Timer will really let you know 'Who was first'. As an added bonus, this circuit lets you handicap one of the players, so as to even the odds...

YOU MAY HAVE seen this sort of circuit before, where the first person to press their button wins and lights his or her LED. The other player's buttons are then disabled until the master reset clears the circuit for the next game.

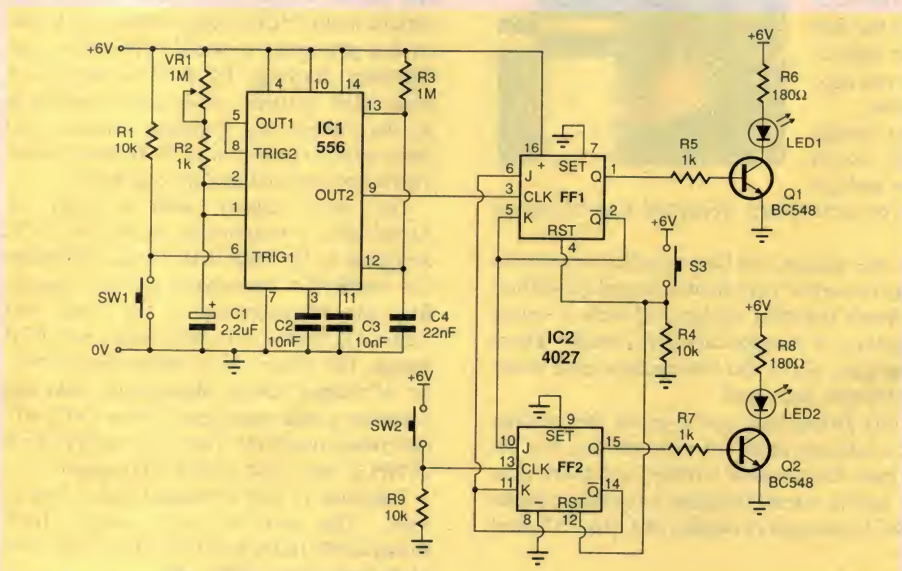
This quiz timer differs a little from previously published designs, though, in that it allows you to set a handicap for one of the players. A delay of up to two seconds can be set for one of the switches, and this will let you compensate for particularly fast players.

The circuit is based on two J-K flip-flops that are cross connected, so that when one is flipped it prevents the other one from flipping as well. J-K flip-flops are triggered by a positive-going edge at their clock input, and for FF2 this is provided by a simple pushbutton (SW2), so by pressing it the clock input of FF2 swings high.

FF1, on the other hand, incorporates a delay circuit built around two 555 timers. Pressing SW1 triggers the first of these timers, which then generates an output that goes high for up to two seconds. This delay



The quiz timer is shown here in a rather bare-bones form, with practically everything mounted on the board. You might like to mount each of the pushbuttons in a separate hand-held case (such as a film canister) and perhaps connect up an earlier $10 Wonder — such as the Audible Warning Device — to let everyone know who won...



period is set by adjusting VR1, and at the end of the delay the output swings low and triggers the second timer to produce a short high pulse to trigger FF1. If VR1 is set to its minimum value the handicap is only about 1ms.

When a J-K flip-flop is triggered the change in its outputs depends on the logic levels at the J and K inputs:

If both J and K are low: Q does not change.

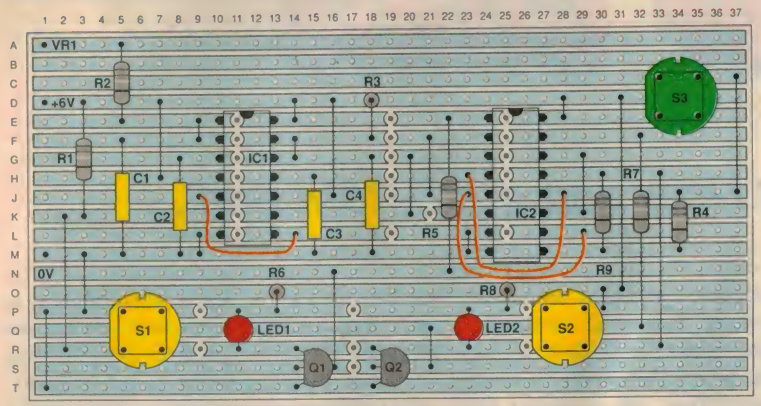
If J is low and K is high: output Q goes low (or stays low if it is already low).

If J is high and K is low: output Q goes high (or stays high if it is already high).

If both J and K are high: Q changes to the opposite state.

The two flip-flops (IC2) latch to show which button was pressed first, with Q1 and Q2 buffering the outputs. The 556 dual timer inserts a 0 - 2 second delay after SW1 is pressed to handicap one of the players.

by Owen Bishop



Nothing much to look out for in constructing the Quiz Timer, just make sure that you install all the links. Note that VR1 connects between A1 and D1 (+6V) on the left hand side of the board.

Output Q-bar is always the inverse of Q. To get ready, both flip-flops are reset by pressing S3, which makes their Q outputs go low and their Q-bar outputs go high. Both J and K inputs are then high. When one of the clock inputs is triggered, (somebody pressed a button) the Q output of that flip-flop goes high and the Q-bar output goes low. The Q output going high turns on the LED connected to that flip-flop (*they* won!). The Q-bar output going low makes the J input of the other flip-flop low. With J low its Q output stays low even even when it is triggered, and so its LED stays off.

The end result is that whichever player presses the button first, their LED lights but their opponent's LED will remain off.

If you want a simpler project with no handicapping action, the circuit works as a straightforward 'Who was first?' detector if you omit IC1 altogether. Replace it with a pushbutton and resistor wired like the input network for FF2, so that the input to FF1 is pulled up when the button is pressed.

Construction

Fig.2 shows the complete circuit assembled on a single piece of stripboard, which makes it easy to build. You can, of course, put LED2 and SW2 on a separate board if you want the players to face each other. You can also enclose the circuit in a box (or boxes), mounting the pushbuttons and LEDs on a front panel, with flexible wires connecting them to the strip-board.

The operating voltage is quoted as 6V DC, so it could be powered by four D-type cells or by a 6V DC mains adaptor. It will also operate on 9V DC, but the series resistors of the LEDs should then be 330Ω instead of 180Ω.

Assemble the timer circuit first, including the pushbutton SW1. The output of the first timer (pin 5) is normally low, but goes high (about 4.6 V) for around two seconds when SW1 is pressed (assuming VR1 is set to its maximum resistance). The output of the second timer (pin 9) is normally high but goes low for a short period after the delay.

Next assemble IC2, including the input network (SW2, R9) and the reset network (SW3, R4), but not the outputs to the transistors. Use a meter to check IC2's outputs (pins 1 and 15) when you press SW3, then SW1 and SW2. Try pressing SW1 before SW2 and the other way round, with various delays between them to check that the priority is properly determined and that the handicapping is effective.

Remove IC2 from its socket and assemble the output stages. Use a flying lead to connect the sockets of pins 1 and 15 to +6V to check that the LEDs light correctly. Replace IC2 and the circuit is ready for action. ❖

Parts List

Resistors (All 1/4W, 5%)

R1,R4,R9	10k
R2,R5,R7	1k
R3	1M
R6,R8	180 ohms
VR1	1M linear potentiometer

Capacitors

C1	2.2uF 16V tantalum
C2,C3	10nF MKT or greencap
C4	22nF MKT or greencap

Semiconductors

IC1	556 dual timer IC
IC2	4027 dual J-K flip-flop
LED1,LED2	5mm LED
Q1,Q2	BC548 NPN transistor

Miscellaneous

3 x PCB mount pushbutton; Stripboard 50mm x 94mm (19 strips x 37 holes); 3 x 1mm terminal pins; 14-pin IC socket, 16-pin IC socket.

Computer Clinic

A success, Dual-booting Linux and a 'CD-ROM God'...

Spurious floppy

Thanks for dealing with my 'boot disk error...' problem in the November 1998 issue. You have solved (or at least bypassed) the problem for me. I simply changed the CMOS to boot from C: then A: and it boots first time every time now. There is obviously some sort of problem lurking around drive A, but that is better than a drive C problem (I hope). (Bruce Howard, by email)

Thanks Bruce, your letter arrived just in the nick of time. My credibility in tatters, I was about to publish this letter from Jerry Fox, of Northcote, Victoria:

The hard drive start-up problem experienced by your reader is often caused by a faulty power supply that cannot supply sufficient +12V current to bring the drive up to speed before the system tries a disk read. It is often traceable to faulty electrolytic capacitors (either low value/high ESR) in the mains input reservoirs or in the +12V output filter. Occasionally one of the dual Schottky diodes involved in the +12V rectification can go open-circuit.

Which would have made a lot more sense than my ramblings, I agree. It looks as though I had forgotten the first law of computer repair: 'It's Probably The Power Supply'. Power supply problems can cause just about anything from brick emulation mode to bizarre, hard-to-trace disk errors. While disabling floppy boot seems to have worked for you, Bruce, you wouldn't do badly to have a good look at the power supply, as it could well be at the root of the problem.

The Linux option

Your RedHat article was very interesting and made more so now that Intel, etc. have invested in Red Hat. However it left us hanging a little when it came to 'co-existing' Red Hat with Windows 95. Could you carry it just that little bit further to tell us how to go about gaining the ability to boot up either Linux or Win95 or even plain DOS?

Tom Moffat showed us how to boot up DOS with WIN 95 installed, I guess something along the same lines would be the thing. (Peter Hulme, Taupo. New Zealand.)

Setting up a dual-boot system is a somewhat tricky business, and when the operating systems involved use incompatible disk formats (as with DOS/Windows and Linux), it gets even trickier. It's by no means impossible, though; all it takes is a little hacking.

First up is the question of which hard drive to install Linux on. Putting Linux and DOS (or Windows 3.1 or Win95, I'm just going to call them all DOS from here on) on one physical hard drive involves repartitioning the drive, installing Linux in the newly created partitions and reinstalling DOS. What's more, Linux's boot partition has to reside completely below the 1024th cylinder of your drive, limiting the size of your C: partition to about 500MB.

All this is a little ungainly, especially if you want to uninstall Linux later on. A much better way of going about the whole process (and the method I'm going to describe) is to install Linux on a separate drive. This way, you don't have to lose your existing DOS system, and you can finally find a use for that old 500MB drive that you have kicking round the place. Also, uninstalling Linux (should you ever find a reason to do so) is simply a matter of FDISKing the drive back to DOS.

Install the new drive in your machine (primary slave is a good position, as Linux is a bit picky about IDE channels), and autodetect it in the BIOS. While you're there, see if your BIOS supports booting from CD, and if so, enable it. Now insert the Linux CD and reboot. If your motherboard won't boot from CD-ROM you'll need to insert the Linux boot floppy at this point.

Run through the installation procedure until you get to the partitioning section. It

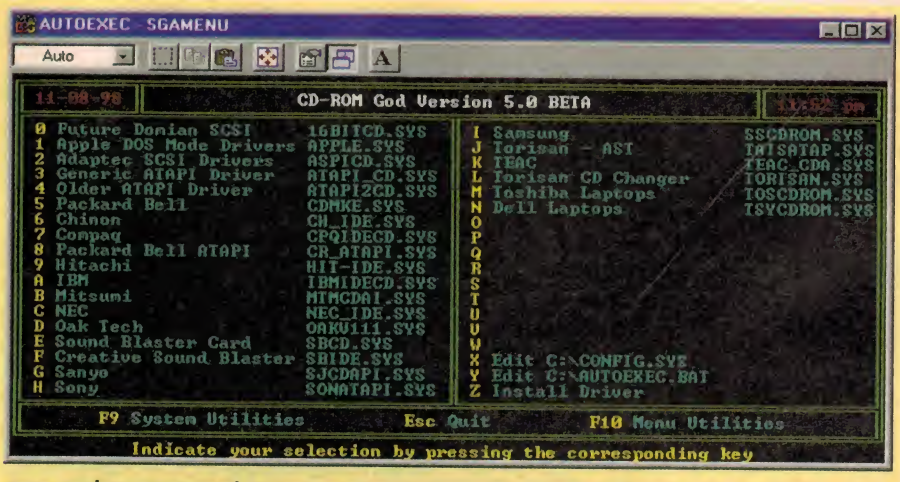
DOS box

More on CD-ROMs

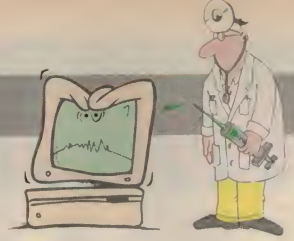
Despite all the technical innovations in recent years, including motherboards that can actually boot off CD, you still can't get to your CD through DOS without going through the tedious process of installing the appropriate drivers in your config.sys. Even Windows 98, with its vaunted CD-ROM support on the startup floppies, can't handle drives that aren't Plug 'N' Play compliant.

This means that if you are using a slightly older CD-ROM, getting the thing up and running in DOS can be a real pain in the neck, especially if you only need it to reinstall Windows 95. If you do have a difficult setup, and you don't want to spend hours mucking around with IDE port addresses and obscure SCSI parameters, you might want to check out a rather nifty little package I've discovered, called The CD-ROM God.

Available from the rather inappropriately named http://www.gamesonline.com, The CD-ROM God is basically a huge collection of CD drivers, device loader utilities and menu programs that is more or less guaranteed to get you up and running. All you have to do is unzip the package onto a bootable floppy, and boot off it. A list of drivers appears, and you simply keep trying different ones until you find one that works.



Once you have found a driver to suit, you can simply return to the prompt and use your CD as normal, or you can choose to have the driver installed to your CONFIG.SYS and AUTOEXEC.BAT automatically.



Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to electaus@magna.com.au, or fax or mail it in to us here at EA.

might bring up a scary-looking requester telling you that the partition table on device **hda** (Hard Drive A, your DOS drive) is corrupted. This just means that it can't make sense of the DOS partitioning scheme, so just hit 'Skip drive'.

Now you can set up the partitions you want to use for Linux on device **hdb** (the drive you've just added). There are two tools available for partitioning your drive: FDISK and Disk Druid. The Linux version of FDISK is definitely for power users, looking for all the world like good old DOS DEBUG. Disk Druid, on the other hand, sports an all-singing, all-dancing graphical interface and is probably best if you don't know exactly what you're doing.

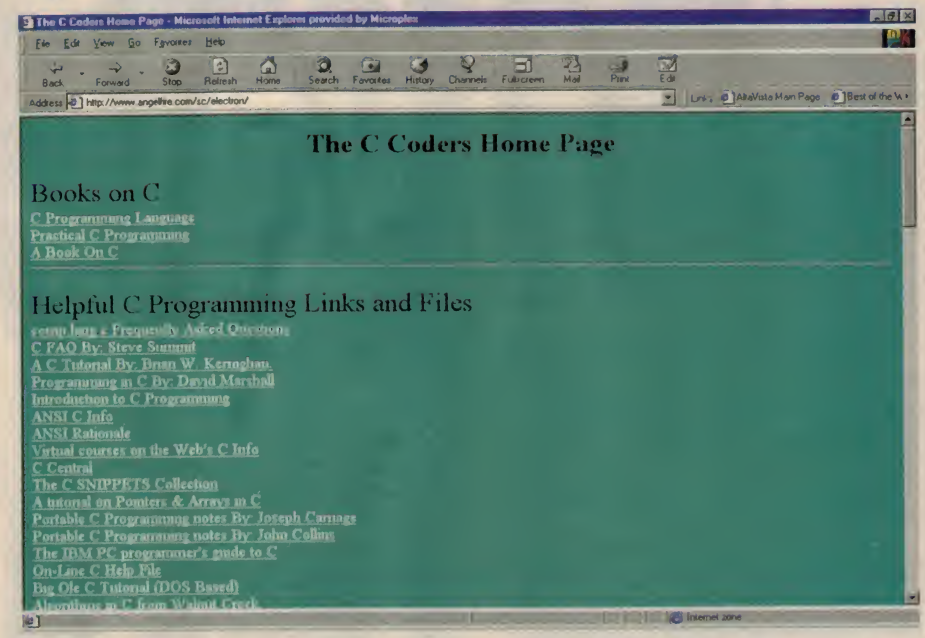
The manual describes the partitioning process in some detail, but for a quick-and-dirty install, you can get away with a 60MB boot partition, a 40MB swap partition and the rest of the available space taken up by /usr.

Once you have done that, the rest of the installation procedure is fairly automated, with just a few questions to answer. It will ask you where you want to mount your DOS partition; I suggest putting it down as /c. (once Linux is up and running, you will be able to see the contents of your C: drive by typing ls /c)

Continue with the installation until it asks you where you want to install the bootloader. You'll want to install it on the master boot record of **hda**. This will allow Linux to boot, even though it is not installed on the C: drive. (If you are running any virus checkers on your DOS system, they'll probably panic when they see this, so just tell them to ignore the modified MBR.)

Next, it will ask you if you want the bootloader to boot other operating systems; this is necessary if you want to be able to boot back to DOS. The default settings of DOS on hda1 and linux on hdb1 should work, so just continue to the end of the installation.

Every time you reboot from now on, your computer will come up with the prompt 'LILO Boot:'. This is where you choose which operating system you want to use for this session. If you wait five seconds or press return, your system will (if all went well) boot into Linux. If you want to boot to DOS, simply type 'dos' at the prompt, and hit return. The system should then boot into DOS or Win95 exactly as it did before you installed Linux.



Welcome to www.angelfire.com/sc/electron, a very useful website with a veritable 'sea' of source code... They don't go in for jazzy graphics and dancing logos, which is a Good Thing really.

If anything goes wrong, or you want to disable Linux completely, boot from a floppy, and type FDISK /MBR. This will remove LILO from the Master Boot Record, causing the system to forget all about Linux.

This is about the most basic dual-boot setup you can get; there are a number of refinements you can make, but I'm a little short of space, so I'll continue this next month. Good luck!

A source of source

Can you please advise of any web sites for getting examples of source code for the 'C' programming language? (Roy Hopkins, via email)

Well, this sounded like an easy one, until I actually went to find some... When it comes down to it, there aren't an awful lot of general-purpose C source archives out there. The one that I refer to if I ever need anything is the Snippets collection, at **http://www.snippets.org**. There you will find hundreds of routines, header files and code fragments, all listed by category. If there's an algorithm you need, that's the place to look.

As for others, though, you'll have a hard time finding anything to beat it. Walnut Creek have lots of source code on their massive site at **ftp://ftp.cdrom.com/pub/simtelnet/msdos/c/**, and at **http://www.cdrom.com/pub/algorithms/c/**, but it's not terribly organised, so you might have to dig a bit to find what you want. For a huge list of links to just about everything C related, check out the C Coders Homepage at **http://www.angelfire.com/sc/electron/**.

Flywheel

Another nifty bit of software I want to tell people about is Flywheel, from Plannet Crafters. Flywheel adds mousewheel support to virtually every Windows application, making up for a serious gap in the implementation of wheely mice. The mouse wheel is possibly the most useful addition to the GUI since the right mouse button, and if you have ever rolled your mouse wheel in an application that doesn't support it, you need Flywheel. (If you don't have an Intellimouse or other wheely mouse, you need one. Trust me on this!)

As well as basic wheel scrolling, Flywheel provides a number of other useful features, such as page-at-a-time scrolling, application switching and the extremely useful ability to scroll a window without first making it active. The shareware registration is only US$10, so if you have a wheely mouse, go to **http://www.plannetarium.com/** right now, and download the trial version. ❖

Moffat's Madhouse

"I know, but I'm not telling..."

A FEW MONTHS back, I related the big adventure of my new Sony laptop computer and the Windows 98 operating system that came with it. I wanted that particular computer dearly, but it was impossible to get it without Win98 already installed. So I became a forced and unwilling Windows 98 user.

Sometimes there is a bright side to things, and in that column I said "All right, I'm going to give the damn thing a chance... I'm giving Windows 98 a fair trial. But sometimes it is very hard to be fair. Since day one, Windows 98 has been crashing regularly in my new Sony, usually on exit."

And there were other problems, too. Not fatal problems, but niggling. For instance, you probably know of the hardware configuration area that's part of every computer. It's usually known as the 'BIOS' settings; here you can do things like assign COM: numbers to various ports, or specify how memory is to be used. On a notebook computer there are also features to set how the computer expends battery power, such as dimming the display or turning off the disk drive motor after a certain time. In the case of the Sony laptop, you can also set default screen brightness and contrast within the BIOS.

When I first got the computer I went through the BIOS and set up everything just like I wanted it, and then saved it for ever more into non-volatile RAM. But every time Win98 booted up, something took charge of the BIOS settings and forced everything into maximum performance mode — including turning up the screen to full brightness, the microprocessor to maximum speed, and the power to maximum drain. The computer compensated for this by turning on its little blower fan continuously, any time the computer was running. Sony's own software could have contributed to this behaviour, but whatever it was, it was a real pain.

Most distressing of all, to me at least, was the way Windows 98 was totally based on Microsoft Internet Explorer — no longer just a web browser, but an operating system within itself. MSIE installed itself on boot-up, remodelled every window in its own image, and seemed to butt its nose into every operation of the computer. And I could find no way to stop it, as I had in Windows 95.

Back to Windows 95?

So, for five weeks I tolerated the crashes, and BIOS takeover bids, and heat dissipation, and continuous disk drive running, and the trials and tribulations of Internet Exploder, until the day a new Dell desktop computer turned up at work. You can order these Dells practically custom-made, with a choice of Windows 95 instead of 98, and NO Internet Exploder. Our Dell wasn't the latest and fastest model, just a Pentium with a 300MHz processor, about the same speed as my Sony laptop. Yet the Dell loaded stuff and ran stuff in a very snappy fashion, rather than slogging along like the Sony. So I made the decision right there — revert the Sony back to Windows 95, a totally clean install.

One always worries about zapping the hard disk and then losing the special hardware drivers for things like the video card, the modem, and the sound card. But the Sony came with a special CD-ROM containing all the drivers needed by the computer, each in its own folder which you could click to start installation.

"Sorry," she said, "We will no longer support your computer since you put Windows 95 in it. That computer is Windows 98 only."

Things did indeed look promising, but as one final precaution I phoned Sony tech support, and a very friendly and knowledgeable technician answered on the third ring. I asked him about the regular crashing, and he said yes, there had been reports of that. He suggested I should start deleting things from the automatic startup group, and that 'might' help. (Then again, it might not...)

So I said I was very seriously considering dumping Windows 98 and installing Win95 instead, what did he think? The tech said that sounded like a reasonable course of action, and if I decided to do so I should have Sony's various tech support numbers available — which he proceeded to dictate to me over the phone. And then he wished me success and good cheer, and that was the end of the call. Very promising indeed.

I spent the next several hours copying all my important data from the Sony onto one of those Sparq removable 1GB hard drives that plugs into the parallel port. With everything safely stored away I rounded up the various floppies and CD-ROMs needed to bring up the computer from scratch, and then I was ready to go.

I've always liked the idea of splitting a big hard disk into several 'logical' drives, to that the one disk becomes the C, D and E drives. In the Sony's case, it had been using the new 32-bit file system. Some of my older MS-DOS software could only run under the original 16-bit system, so my plan was to make the C and D drives FAT32 and the E drive FAT16. I'd never heard of anyone doing this before, but it worked like a charm. Soon all my elderly and much loved 16-bit software, including my 1985-vintage spell checker, was back in business in the Sony.

Windows 95 installed into the C drive in the usual way, and I'd set aside the D drive for large windows applications and data storage, making the most efficient overall use of the hard disk.

Prior to the FAT32 file system, there was a troublesome limit to the number of file allocations on any one disk, so big disks had to use big units, up to 64K, called clusters. FAT32 is arranged to use 4K clusters regardless of disk size, and I sized the FAT16 E drive so it used 4K clusters too, so very little space was wasted.

In its original configuration the Sony's 2.1GB hard drive was nearly half full with Windows 98 and business software I had no need for. After conversion to Win95, nearly 80% was free for my own purposes.

The Sony uses a really snazzy display system called NeoMagic which produces excellent text and graphics. But most importantly, it can feed a composite video

signal to an external TV monitor, in either PAL or NTSC format. I've been busy constructing a new community TV station. When it came time to give it the smoke test, putting out a signal on cable channel 42, the source was a station logo from a .GIF file in my Sony laptop — fed straight into the studio's modulator. So the computer makes a handy test instrument.

It was here that I learned that my re-install optimism was a little premature. The computer came up in standard 16-colour VGA mode; NeoMagic was NothingMagic. So I fired up the Sony CD-ROM with the drivers on it, went to the 'Video' folder, and clicked. The CD-ROM twitched once, and that was all. No new video drivers.

So it was time to take up that nice technician's offer and phone Sony tech support. This time there was a 20-minute wait on the phone before a woman answered. I told her I was having trouble making the video drivers install. She asked why I wanted to re-install the drivers, and I told her I'd just reformatted everything and replaced Windows 98 with Windows 95.

"Sorry," she said, "We will no longer support your computer since you put Windows 95 in it. That computer is Windows 98 only."

So what am I supposed to do, I asked? "Give us $19.95 and then we'll answer your questions." But what about that guy yesterday, so said to go ahead and install Windows 95? Well, he was wrong, she said, and I'd just been switched from free tech support to paid tech support — on a computer that was barely five weeks old.

Time for hacking

So I told the lady to forget it, and that my high regard for Sony over the years had just taken a big blow. Then I withdrew to consider my options. It was time for some educated hacking, exploring within that Video folder on the CD-ROM to see what was actually happening.

What I found was a batch file containing a list of MS-DOS commands to copy various video driver files to various directories in Windows 98. But the Windows 95 directory structure was slightly different, so the video install routine was bombing out with a 'directory not found' error. I took note of the directories it wanted for Windows 98, established them within Windows 95, and soon we had NeoMagic back in action — with no thanks to Sony.

Similar problems cropped up with things like the audio drivers; others such as the mouse were programs in their own right which installed normally.

As I hacked my way through the driver CD-ROM, the Sony laptop slowly regained its old capabilities, except for one: I still haven't got the PCMCIA card and socket services to work under Win95. The hardware is by Ricoh, so it should be fairly common, maybe even in older Sony laptops. So I put out a call for help on the 'comp.sys.laptops' newsgroup; this usually brings results. But so far, zilch, and no PC cards. One lives in hope.

The PC-Card problem is no big deal right now, because the Sony has its own built-in modem and my PC-Card modem isn't needed. Other than that, it's one very slick computer now that it's no longer burdened with Windows 98. The Sony hardware itself, like most Sony stuff, is beautifully designed, very rugged, and efficient. The hard drive is lightning fast, and Windows loads in a few short seconds.

I now have total control over the BIOS. Instead of everything running at full-bore maximum performance as it did under Win98, I can now set the computer's power management to a 'balanced' mode between maximum performance and maximum battery life. The computer runs much cooler, and the fan has never switched on since Win95 was installed — even on days over 30°C.

I can use function keys to command the computer to go gracefully into 'suspend' mode for short-term shutdowns, or 'hibernation' mode for more lengthy breathers. When you close the cover, the computer nods off into 'suspend' by itself. This is all very elegant stuff, which had been badly clobbered under the previous operating system.

It's now also possible to use the Internet software I want, instead of what's forced on me. So Eudora is back in charge of my e-mail, in its workmanlike way, and if I click on a URL link in a mail message, Opera comes up to handle it, loading in a flash. Also, since I've got so much hard disk space now, I've invited the whopper version of Netscape Communicator into the Sony to handle heavy-duty web sites and newsgroups. But even this supposedly benign software package sometimes tries to force me into signing up for America Online Instant Messenger — something else waiting to be hacked out of the computer.

This whole Win95 back-grade raises some serious questions about the computer business. Is it right for Sony to sell computers with something like Windows 98 as its 'compulsory' operating system, and penalize the owner for wanting to change? What would have been the case if I had bought a computer with Windows 95, and then wanted to 'upgrade' to Windows 98. Would I have kissed my tech support goodbye too?

On the other hand, consider Dell: the computer we bought at work came with books and support disks, and an open invitation to make the machine into anything you want to, with Dell's blessing. I've got the name of a guy who is my own personal account rep, and I've got his direct extension number to avoid waiting through the endless voicemail queues.

The Dell instruction manual contains things such as step-by-step procedures for chopping this or changing that. There's even a list of those mysterious beep codes the computer emits if it's in really deep trouble. It is so refreshing to be treated with intelligence and understanding, instead of being forced into the standard Microsoft mold of conformity.

Footnote

This is the 100th Moffat's Madhouse column. At an average column length of 2000 words, that means 200,000 words of Madhouse. If you've tolerated this drivel since day one, eight and a third years ago, that means you've waded your way through the equivalent of a fairly substantial novel. Thanks for sticking with me! ❖

ALTRONICS COMPONENTS

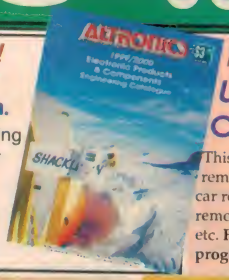
Fax Order Line: (08) 9328 3487

PRE-CATALOGUE CLEARANCE SALE!

Altronics is proud to announce that our 1999/2000 Engineering Catalogue is due out early next month.

Our purchasing department has been run off it's feet sourcing heaps of new products for to ensure this is our best ever catalogue. Your ***FREE*** copy is available in Silicon Chip magazine February issue.

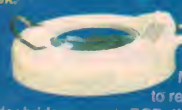
Best Regards,
Jack O'Donnell, Managing Director



Illuminated Magnifying Lamp

"Fantastic for servicing PCB's and identifying micro miniature components"

The magnifying head is easily set to the desired position on it's spring-loaded arm assembly. Simply clamps to your workbench or desk.



NEW!

As you grow older, it's inevitable that your eyesight is going to falter. Maybe you're already finding it difficult to read those tiny zeners or find that small solder bridge on your PCB. If so, this magnificent 3 dioptre illuminated magnifier could be the solution for you. Uses are not only limited to electronics, of course. It's ideally suited to stamp and coin collectors, model makers, embroiderer, jewellers and the like.

No workbench should be without one!

A 0970 Normally $149, *NOW ONLY* **$125**

Gas Powered Soldering Irons

NEW!

The advanced *IRODA* Soldering Iron offers go-anywhere soldering convenience. It features a thumbwheel heat control, cap mounted igniter, long life catalyst tips and a huge gas reservoir for long use-time. The kit consists of the *IRODA* Gas Soldering Iron supplied in a handy carry case with a range of tips and accessories.

Features: • Transparent gas chamber • Igniter built into cap • Uses standard butane gas • Supplied with safety stand, cleaning sponge, solder dispenser, blow torch, hot air blower and hot knife cutter

T 2592 Complete Kit, will retail for $89.95

SPECIAL INTRODUCTORY PRICE **$69.95**

T 2590 Iron + Blow Torch Tip, will retail for $49.95

SPECIAL INTRODUCTORY PRICE **$39.95**

BONUS OFFER! *The first 100 callers to purchase either a T 2592 or T 2590 qualify for our FREE bonus offer of a roll of T 1100A solder and a T 2447 Butane Refill, together valued at $11.45 ABSOLUTELY FREE!*

19 Range Digital M/Meter

This DMM is small enough to literally fit into your pocket! Great for the trades person on the move, or for a student lab kit. Includes an audible continuity buzzer, 'K' type thermocouple, and square wave test signal output. Measures DC Volts to 1000V, DC Amps to 10A, AC Volts to 750V, resistance to 2MΩ and temperature from -20°C to 1370°C. It even includes a diode test function! Measuring only 70 x 126 x 25 mm and weighing only 170g, this meter is a pocket rocket with a price to match!

INCREDIBLE VALUE
Complete with K-Type Temperature Probe!!

Q 1051 Was $29.95, NOW **$19.95**

Q 1054 Carry Case ONLY **$5**

LCD Bike Computer

STOP
Why pay twice the price or more elsewhere?

This compact computer has all the features you'd expect PLUS for added security you can remove it from the bike when not in use.

Features: • Current Speed • Average Speed • Maximum Speed • Trip Time • Trip Distance • Total Distance (Odometer) • 24Hr Clock Time • Countdown Timer & Distance. Supplied with mounting brackets, magnetic pickup, spoke magnet, even the battery! **(Valued at $3.95)**

A 1200 Was $37.95 NOW **$29.95**

NEW!

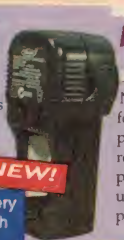
Intelligent UHF Remote Control

Put your car alarm and garage door opener on one remote!

This miniature intelligent *learning* remote control can be used as a replacement for your car remote control or to combine more than one remote. ie. Garage door, car, motorbike, home alarm, etc. **Features:** • **Four programmable buttons** • **Easy to program** • **Wide operating frequency range of 255-500MHz** • **Includes alkaline battery**

A 1015 *ONLY* **$39**

Compact 240V Plug-In NiCad Battery Charger



Charge your batteries in ***less than 8 hours*** with this versatile charger! Charge either 2 (5hrs charging time) or 4 (7hrs charging time) AA batteries at a time.

A 0285 ONLY **$19.50**

NEW!

BONUS OFFER For this month ONLY, with every A 0285 charger, receive 4 x S 4705 700mAh NiCad Batteries Valued at $10 *FREE!!*

NiCad Batteries

GOOD FOR UP TO 1000 RECHARGES!!

NiCads will eventually pay for themselves, and can provide hundreds of recharges if cycled periodically. They can be used in just about any battery powered appliance.

S 4705 700mAh AA Cell Normally $2.50 ea, NOW **$2** ea, 10 & up, or **$1.60** ea, 25 &up

S 4710 1500mAh C Cell Normally $5.50 ea, NOW **$4** ea, 4 and up, or **$3.50** ea, 10 & up

S 4715 1500mAh D Cell Normally $7.25 ea, NOW **$6** ea, 4 and up, or **$5.50** ea, 10 & up

S 4720 100mAh 9V Cell Normally $12.95 ea, NOW **$8** ea, 2 and up, or **$7.50** ea, 4 & up

NiCad Batteries with tags... NEW!

...for toys and cordless tools

Sooner or later, your model racing car or cordless drill will stop when the batteries give up. Take advantage of these LOW PRICES to put some life back into your toys and cordless tools!

S 4605 800mAh AA Cell with tags ONLY **$3.50** ea, or **$3** ea, 10 up

S 4608 1800mAh C Cell with tags ONLY **$6.80** ea, or **$6.50** ea, 10 up

AA Nickel Metal-Hydride (NiMH)

S 4745 1300mAh (NiMH) AA Cell Was $5.95 ea, NOW ONLY **$4** ea 4 & up, or **$3** ea, 10 & up

Altronic Distributors SYDNEY

W A N T E D

Bright electronic enthusiast required for position of Sales Representative in our Wholesale Division.

Requirements: Must possess a positive attitude and be self motivated. Must be familiar with electronic components. An interest in Audio Systems would be a distinct advantage. Rapid promotion for the high achiever. Reliable vehicle + drivers licence essential. Generous Salary, mileage allowance and Bonuses.

Contact Peter Deeb - Sydney State Manager on 02 9648 5266 for an interview.

Modular Cable Tester Kit

Save hours of tedious fault-finding, only to find the wiring is the problem!

This handy unit can test continuity, open/short and cross wired LAN wiring or modular leads. *Features:* • Auto/Manual Scan modes • LED indicators for all connections including Ground • Will test 10Base-T, 10Base-2,RJ45/RJ11, 258A, TIA 568A/568B and Token Ring • BNC to RJ45 Adaptor included • Includes Soft carry case

D 3010 ONLY **$199** NEW!

Intelligent Programmable Remote Control

With Backlit Screen

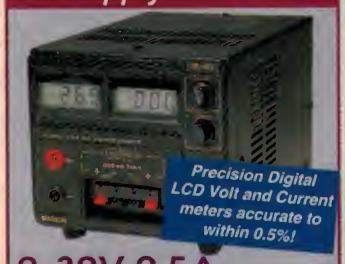
This *learning* remote control can replace up to eight remote controls! *Featuring:* • 8 Different Appliance Modes • 2 Auxiliary Modes • Intelligent Backlighting - Once Activated, dims away after being idle for 5 seconds, saving batteries! *(Unlike others on the market)* Requires 4 x AAA batteries (supplied). *See our 1997/98 Cat. p170 for full details.*

A 1000 Was $199, *NOW* **$169**

1-800 999 007 PERTH (08) 9328 1599

OVERNIGHT DELIVERY

A Bench Power Supply for Life!



0-30V 2.5A Power Supply

A lab supply with a main output rail adjustable from 0 to 30V, at up to 2.5A.
***Features:** • Separate controls for voltage and current limiting • Fixed 12V and 5V output rails, at up to 1A peak • Precision digital LCD Voltage and Current Meters for fine adjustment for use in research and development labs, instrumentation testing, digital circuits, etc.*
M 8200 Was $229,
NOW **$189**

125W MINI INVERTER

AMAZING GRUNT!!
This great inverter provides up to 125W of 240V AC power from your cigarette lighter socket! Just some of the uses are to power televisions, VCR's, lights, small battery chargers, shavers and hi-fi systems. Features low battery indicator, thermal & overload shutdown. Built-in 3-pin plug (no adaptor required).
Includes cigarette lighter socket lead.

"There are quite a few different 12V to 240V inverters on the market, but few are as compact and as neatly packaged as this one" ***Silicon Chip, April '97***

M 8105 ~~$159~~ NOW ONLY **$119**

POWERHOUSE INVERTERS

Operate 240VAC appliances from a 12 or 24V battery *ANYWHERE, ANYTIME!!*

Using the latest MOSFET output stage and toroidal transformer these inverters are super efficient and will deliver high surge currents. The auto-start mode enables the inverter to remain connected to the battery(drawing only micro amps) and springs into life once you turn on your equipment, saving precious battery power. Some uses are camping, boating, fishing, mining, farming, & remote settlements.

Features: • Dual AC Power Sockets • Auto-start standby mode • Sturdy rust proof ABS case • Heavy duty battery leads • LED status • Circuit breaker protection (600W & 1200W models)

K 6755 300W 12V Input
K 6756 300W 24V Input **$399**

K 6777 600W 12V Input
K 6779 600W 24V Input **$699**

K 6797 1200W 12V Input
K 6799 1200W 24V Input **$999**

All models now include PHASE CORRECTION to run inductive loads. ie.fridges, pumps, small motors,etc.

Micro-Jet Blow Torch

SAVE OVER 30%!

Powered by a refillable gas lighter (supplied), this unique blow torch burns at 1300°C, making it ideal for many types of brazing and heavy duty soldering. The Micro Jet can be ignited and used simply with one hand. It has an in-built piezo electronic ignition system which ensures easy lighting every time. Ideal for the workshop, tool box, work bench etc. Suitable for heavy duty soldering, brazing, silver soldering, hobbies, model construction etc.

T 2490 Normally $24.95, NOW **$19.95**

300W Inverter

Connect this to your car or boat battery and presto - instant 240V mains power for electrical appliances. Suitable for drills, lights and power tools etc. Includes an on/off switch and a light & heavy load switch with metered output.

Includes heavy duty battery leads!

M 8120 Normally $249
Now **$199**

SAVE $50! Fantastic for Farming, Boating, Camping etc.

Screecher Car Alarm MKII

Protect your vehicle for a fraction of the cost of commercial units!

Based on the extremely popular screecher design, this project uses a 110dB siren to blast the unwanted visitors in your car at 2kHz making it very uncomfortable to stay inside or operate the vehicle, this has the advantage of not relying on the noise it creates to attract the attention of others. **Features :** A super bright flashing LED indicator • Soft start entry/exit delay • Two trigger inputs (e.g interior light) • Complete with 110dB siren • Simple to construct and install in any vehicle. • Compact design 76mm x 46mm.

K 4362 **$29.95**

Mini Drill Set

One of the most powerful mini drills we've seen! Great for drilling PCBs, polishing, engraving, etc

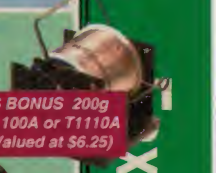
Ideal for making one-off PCBs or prototypes!

A fantastic addition to your tool kit, this powerful mini drill kit includes DC plugpack adaptor, four grinding stone bits, a cutting disc, four chucks (0.5, 1, 1.5, 2.4 and 3mm) and 5 PCB drills (0.5, 0.8, 1, 1.2 and 1.5mm). It's lightweight yet torquey enough to handle some tough jobs! Great for drilling and trimming PCBs, engraving your valuables, model making, polishing gems or jewellery, custom panel work etc.

T 2301 Normally $69, NOW **$59**

Solder Roll Holder

KEEP YOUR SOLDER TIDY AND HANDY ON THE BENCH!



INCLUDES BONUS 200g ROLL OF T1100A or T1110A SOLDER (Valued at $6.25)

This handy solder dispenser accepts 200g and 1kg rolls of solder. Can be mounted on wall or bench.

T 1300 ONLY **$19.95**

Turbo "Cool Down" Timer Kit

Tired of waiting for your turbo to cool down?

(See SC November '98)
Turbo charged engines must be run at idle for a few minutes to cool down after a long journey to avoid damage. This project allows your car to be run for a few minutes at idle speed so you can lock the car and leave it to turn off by itself.
Features: • 90 second time-out • Under temp. disable • Reset switch • Robust flanged box • Simulated Ignition Cutout for immobiliser • No battery power drain once shutdown

K 4060 **$29.95**
S 4335 Optional 30A Relay to suit $6.95

LED Bargraph Ammeter

Monitor your battery's health with this easy to read meter!

Monitoring the charging behaviour of your battery can be advantageous to fault finding the ignition system or perhaps prevent a fault from occurring before it happens. This project monitors the voltage of the negative strap across the battery to provide accurate information on what is happening to the charge and discharge of the battery at any time, from idle to full speed.
Features: • Suitable for all 12V Systems • Supplied in an attractive automotive flanged housing • No need to alter the ignition wiring in any way • Measures up to 25A charge and 25A discharge in 5A LED steps • Easy to construct and install.

NEW!

K 4335 **$26.95**

Micron Soldering Station

SUPER BONUS FREE T 1230 Twin Pk Solder Wick PLUS the T 1300 Solder Roll Holder PLUS FREE Solder with every purchase!! (Valued at $35.15)

The *MICRON* Series 3 soldering station employs electronic switch mode circuitry in lieu of a mains transformer. Excellent for all general purpose and production soldering. **Features:** • High insulation ceramic heating element • Rapid heat-up and heat recovery • Heater insulation of over 100MΩ • Zero voltage circuit minimises high voltage spikes & magnetic fields to prevent damage to sensitive devices • Continuous temperature adjustable from 250° to 430°C • Grounded power cord • Selecting the desired operating temperature is as simple as turning a knob. *Supplied with Long-Lasting Iron Clad Tip*

T 2443 Normally $149, NOW **$129**

YES! We Now Accept Diner's Club and American Express Cards!!

ALTRONICS
174 Roe St. Perth W.A. 6000
Phone (08) 9328 1599, **Fax** (08) 9328 3487
MAIL ORDERS C/- P.O. Box 8350
Perth Business Centre, W.A. 6849

Standard Delivery & Packing Charge: $4.00 to 500gms, $5.50 500gms-1 kg, $8.00 1kg-5kg. Where possible we process your order the day received and despatch via Australia Post. Allow approx 9 days from day you post order to when you receive goods.
Overnight Jetservice: Up to 3kg is $9.50, 3kg to 5kg is $16.00—We will process your order the day received (if placed before 2.00PM WST) and despatched for delivery the next day. Country areas please allow an additional 24-48 hours.

Prices: Please note, Normal RRP rates quoted are current selling rates and may vary slightly from catalogue pricing.(Primarily due to the softening of the A$).**Heavy Service:** All orders of 5kgs or more must travel Express Road—Please allow up to 7 days for delivery. $12.00 to 10kgs. $15.00 over 10kgs. **Insurance:** As with virtually every other Australian supplier, we send goods at consignee's risk. Should you require insurance cover against loss or damage please add $1.00 per $100 of order value (minimum charge $1). When phone ordering please request "Insurance". **Altronics Resellers:** Chances are there is an Altronics Reseller right near you—check our catalogue list or phone us for details of the nearest dealer. Blue Ribbon Dealers are highlighted with a ■. These dealers generally carry a comprehensive range of Altronic products and kits.

1-800 999 007 PERTH (08) 9328 1599

Fax Orders (08) 9328 3487

Vintage Radio

The Raycophone 41E: a rare Australian 'cathedral'

The 'cathedral' style of tabletop radio cabinet rose to fame in the USA. Only a few Australian firms made a foray into this style — amongst them Raycophone with its 41E, which can also claim to be a true classic.

JUST WHAT defines a 'classic' can be debated, of course, but the elements must surely involve conforming to the technology of the day — well built, an individual style and receiving public acclaim. In this regard the Raycophone 41E surely qualifies. I'm not sure if the 41E was a public favourite in its day, but the cathedral style is certainly very popular nowadays amongst collectors, most of whom aspire to have an example in their collection.

The name Raycophone comes from the name of the firm's founder and notable engineer, Raymond Cottam Allsop, who did much to develop sound installations for movie theatres of the late 1920s, and also pioneered FM broadcasting in this country. From 1930 until about 1935, the company produced a reasonable range of radios of which, it seems, the 41E is/was the only true arch-topped 'cathedral' cabinet. Perhaps the decision to enter the domestic manufacturing marked was prompted by the new tariff protection for locally made receivers.

(Further information about Ray Allsop can be found in the late Neville Williams' column 'When I think Back', in *EA* for January 1990).

The cabinet

The cabinet is actually very stylish, and one of the first thing that one notices is its weight. It is constructed on a routed-edge timber base, which is fully 1" (25mm) thick. Screwed to this are the lower half of the two sides, which are cut from substantial seven-ply and a good 3/8" thick themselves. The top of the cabinet is formed from curved lightweight three-ply, joined at the apex. Beneath this join on the inside of the cabinet is a timber support. The joins at the apex and the sides are externally covered with a decorative moulding.

The front is also made from plywood, and is covered in a quality 'mirror image' veneer. That is to say the veneer is split and joined down the centre line, such that the two sides are a mirror image of each other. A fluted column surmounted by a decorative bell covers the join of the front and the lower sides, whilst the daintiest beaded

Fig.1: A contemporary advertisement for the Raycophone 41E, from Wireless World for May 15, 1931.

chain and a rosette cover the top-half joint. The bells, beads and rosette appear to be made from a compressed and moulded arborous product — perhaps a papier mache mixed with a setting resin?

A most unusual 'art-nouveau' style speaker fret completes the front. There are but two controls, one atop the other, both of which are directly beneath the very small dial escutcheon. At the rear of the cabinet a shaped timber brace reinforces the sides and the top in order to keep it all together.

The similarity between this cabinet and the American 'Colonial' illustrated on the front cover of John Stokes' *More Golden Age of Radio* (Craigs, New Zealand 1990) is too close for coincidence. The advertisement which appeared in *Wireless Weekly* for May 15th, 1931 (Fig.1) and the accompanying photo (Fig.2) clearly show the cabinet.

The circuit

A published circuit has not been obtained, which is not surprising since not that many were available prior to about 1933. The circuit shown in Fig.3 was traced by the author from a slightly modified chassis, and the HT filtering setup has been assumed.

As can be seen, it is a three-stage TRF using type 224-A's, with a type 245 triode output in keeping with the practice of the day.

Starting from the front end, there is the customary two-position antenna connection via a tapping on the primary of the coil. The two tuned RF stages are then fed into a tuned leaky-grid detector stage, which is then coupled via an LC filter to the output stage. (It should be noted that this set was produced during the era when direct coupling was fashionable.)

The anode load of the detector is formed by an audio choke. This was common practice with the old 24A's. The choke of about 30 Henries inductance offers a substantial impedance at audio frequencies, but offers little DC resistance to the valve's HT current. This means that the anode can operate at a decidedly higher voltage than would be the case with the usual 250kΩ anode load resistor, allowing higher gain.

Cathode bias is used throughout. The cathode resistors for the RF and detector stages are physically part of the 'voltage divider' — which in the set shown had only two out of the six segments that were open circuit(!). The cathode resistor for the directly heated 245 is from the centre-tap of

by Roger Johnson

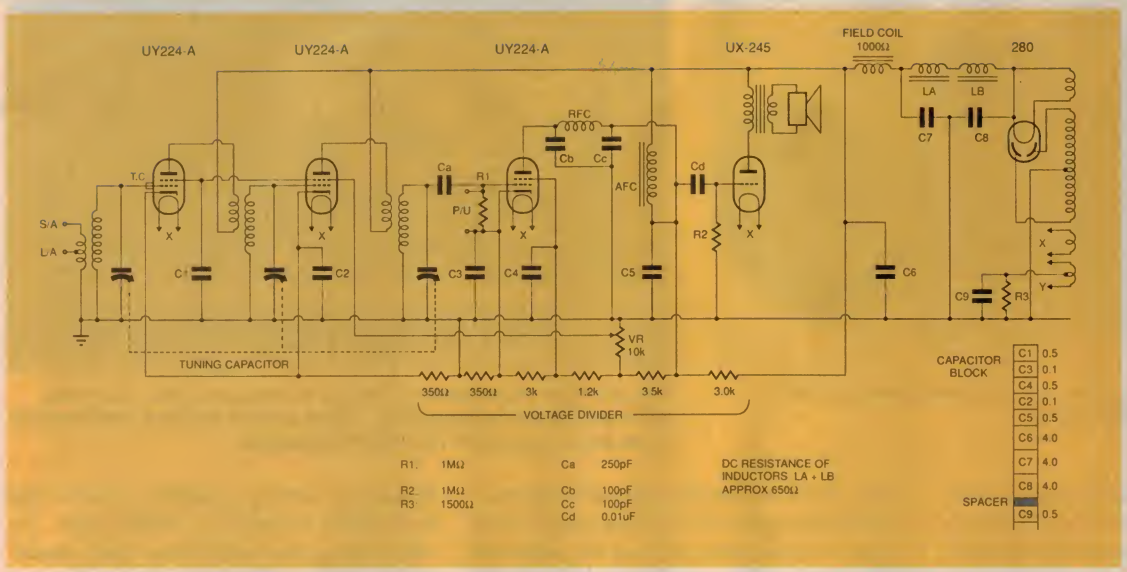


Fig.3: The circuit, as traced by the author. The areas of doubt in terms of authenticity are discussed in the text.

its heater winding and bypassed by a 0.5uF or 1uF paper capacitor to earth; again standard practice for the day.

The detector stage

A grid leak detector is somewhat unusual for a set with two screen-grid (tetrode) stages of RF amplification. Conventional wisdom says that this amount of gain will cause leaky grid detection to overload and distort, because it is being driven too hard, and that the 'anode bend' detector should be preferred. However the designers have attempted to overcome this complication by operating the detector stage in true class-A mode, and returning the grid leak to the cathode.

The normal trick was to operate the detector stage at zero bias with low anode potential. This sacrificed gain for sensitivity, which was a desirable feature in the simple single circuit regenerative detectors.

As you can see there was provision for a pickup, and once again the designers have got it right by placing the input directly across the grid leak — i.e., from grid to cathode. This allows the valve to operate in true class-A condition and at its most favourable voltages for maximum gain.

The normal practice of placing the pickup between grid and earth in the anode bend detectors was an appalling piece of design, which was unfortunately adopted by far too many set designers. In this mode, the anode bend valve was biased almost to cutoff.

When an audio signal from a pickup was applied without any attempt at correcting the cathode bias, the resultant signal was severely distorted. However, such was the 'gimmickry' of the day that the public was largely unsuspecting, and set manufacturers were able to get away with poor design practice and the resultant cost savings in components and switching...

Fig.2: Awaiting full restoration is the very stylish 'cathedral' style cabinet...

Volume control

Volume control is achieved by varying the screen grid potential on the first two stages. This set must have been designed ahead of the release of the variable-mu type 235, which was available in 1931. (Refer to Neville Williams' 'When I Think Back' column, *EA* September 1991).

Volume control by varying the screen voltage was not particularly common in all-electric sets, but by no means rare. It was often used in the early screen-grid battery sets, prior to the introduction of the variable-mu type (2)34.

However the 224-A did have a tendency to become unstable when the combination of screen and anode voltages fell below certain critical values. In this particular receiver, it is not a problem, since the screen voltages even at minimal volume setting is within the range for stability.

HT and filtering

When the receiver shown was first discovered, the speaker had absolutely 'had it'. The frame was rusted, the remaining quarter of the cone was stuck fast, the field coil was open circuit and so were both windings of

Fig.4: Above the chassis. The power transformer and filter chokes are under the black cover.

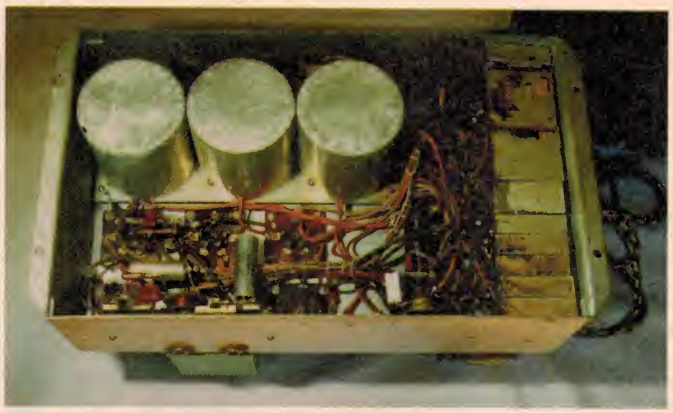


Fig.5: Under the compact chassis. A separate cover normally secures the block capacitors. Three or four modern components have been 'tacked-in' for testing purposes.

the transformer. Two of the four wires were in fact disconnected. (There is no isolating speaker plug, which means that the speaker is permanently tethered to the chassis.) Under the chassis was a bogus filter choke that was obviously a ring-in.

The three paper filter capacitors were connected each side of the twin filter chokes, forming a double capacitor-input filter. All of this wiring appeared to be undisturbed, but the wiring from the rectifier cathode was missing. One possibility was that the speaker field is/was a 7500 or 10,000 ohm winding placed in shunt across the HT supply for regulation purposes. However, if this were so it would be already shunting the 10kΩ voltage divider, resulting in a shunt load of less than 5kΩ. As this would have resulted in an HT drain of some 50mA in itself, it seems unlikely.

A standard 'Rola' type K8 1000Ω field coil speaker has been pressed into service, and has been wired in the conventual way. The output voltage is close enough to 'spot on'.

As there appeared to be no missing filter capacitor, how was the speaker wired in circuit? Initially, it was wired in as a three stage choke-input filter. However, the output voltage was way too low, merely about 180 volts. Tacking a 1uF paper capacitor from rectifier cathode to earth brought the HT up to a more acceptable 230 or so volts. This can be seen in the underchassis photos, in Fig.5.

So here we have the restorer's dilemma: just what is the right thing to do? As there was no evidence of a missing filter capacitor, I decided to use the three capacitors as an input capacitor and two filter capacitors each side of the two chokes in series, acting as one.

Restoration

The set is beautifully made. The chassis is made of heavy gauge spot-welded mild steel. The small securing nuts and bolts survived the ravages of corrosion attacks. One squirt of penetrating oil and the nuts and bolts were easily unscrewed. Not one of them snapped, and they all cleaned up like new. The electroplating must have been of a very high quality.

Despite the metal cover of the power supply being rusted, the power transformer, filter chokes and audio choke were all intact. This was considered a real bonus.

The paper capacitors all proved to be leaky and way off value. Here there is no choice. The little metal cans were opened, the guts ripped out, and a modern capacitor inserted in their place. The typical value for the three filter capacitors is 4uF paper, and fortunately some high voltage 4.7uF electrolytics were on hand, which were near enough. The other bypass capacitors were typically 0.1uF, 0.5uF or 1uF, and here 0.47uF greencaps were the logical choice.

Apart from the voltage divider, there are only three fixed resistors; the two grid leaks and the cathode bias resistor for the type 245 output valve. The volume control was an old wire wound type — open circuit of course, but estimated to be 10kΩ. A suitable replacement was found and it seems to provide satisfactory control.

Once the circuit was traced, the chassis was stripped completely, grit blasted, primed and painted silver. It now looked the part.

The aluminium valve cans had suffered a little corrosion. These were thoroughly cleaned with steel wool, etch primed and painted a suitable dark green, typical of the era. The audio choke was painted to match. The power supply cover also had the rust removal treatment and was finished off in black wrinkle paint. Again this was typical of the day.

The most onerous task was repairing the substantial tuning capacitor, which had completely seized fast. Worse still, the outer casing was made from 'muck metal' or zinc diecast. (There is a good argument to ban this stuff on humanitarian grounds alone!) The centre shaft is only bushed; there is no ball bearing race.

With copious amounts of penetrating oil and gentle pressure over the course of several days, it finally came free. A similar regime had to be applied to the dial mechanism, which had also stuck fast — but fortunately the brackets were stamped from steel, and a little more exertion could be applied.

Performance

The set's performance is not particularly good. The tuning coils are simple solenoids wound with double silk(?) covered plain copper wire. Perhaps the 'Q' is down, due to the ravages of time and the ingress of minute amounts of moisture. Tuning is unnecessarily broad, and only by manipulation of antenna length and connection — and very careful alignment — is it able to pass the empirical test of separating two adjacent local stations on 1323 and 1397kHz.

With only a triode output delivering just under two watts maximum, the audio is not overpowerful, particularly when careful alignment had to sacrifice a little gain for the purposes of selectivity. However, the audio was quite 'clean', and in case anyone is wondering I could discern absolutely no difference between the quality of the triode output and a set of similar vintage using a pentode type 247!

Unfortunately, after about 20 minutes of operation the power transformer had become not just warm, but HOT. Oh well, what is a mere power transformer rewind in the overall scheme of things? A bloody nuisance, that's what! ❖

Information Centre

by Peter Phillips

Clearing the decks

This month I'm taking time out to clear up a few outstanding issues. We look at some technical issues (of course), but we also cover some not-so-technical things — like the effect mistakes in the column might have on young readers, the benefits of controversy, how I choose letters for inclusion in the column and other related issues. And to all readers and contributors to this column, all the best for the New Year.

FOR ME, this month's column is a milestone, as it's now 10 years since my name first appeared in the byline as 'conductor'. When Jim Rowe offered me the column 10 years ago, he ask me to "beef it up a bit", as at the time it concentrated mainly on answering questions about *EA* projects. Of course this is still a role it fulfills, but it's difficult to write an interesting column with such a limited focus, so over the years I've let it 'have its head', inviting readers to comment on, or ask questions about virtually any aspect of electronics.

Another change I made was to introduce the What?? segment. With your support, I've so far managed to find a suitable question each month, and hopefully this will continue. Regular readers might remember this segment replaced the long-standing 'Mystery Item', in which you had to identify a device from a close-up photo of some part of it. Don't remember? If you have a copy, check out the January 1989 issue (page 157).

But perhaps the greatest challenge I've faced is trying to answer the wide range of questions readers have presented over the years. While I've dabbled in most aspects of electronics, there are some areas I'm better at than others. For example, while I know the theory, I have only a limited practical knowledge of ham radio and antenna design.

But you say, he gets it wrong in other areas as well, even the basics! The recent debacle on battery capacity is perhaps my most recent and silliest error, as explained in the November 1998 column. And getting it wrong in writing is almost fatal. You can't retract, you just have to face the music. So, as this is my tenth aniversary, let me now clean up some outstanding issues.

Mistakes & young readers

A common theme amongst those who write to point out an error is the effect it could have on younger readers. The following extract is from a letter sent by a past Dean of Engineering at the University of Adelaide. The letter deals with the recent discussion about the relationship of a commutator in a DC generator, but starts with these comments:

I read your column each month and have noted the debate over the correct phase relationship of the commutator in a generator. As someone in Higher Education I must say that the debate has turned from an 'interesting discussion' to being unhelpful. It has reached the stage where you must now ask yourself about your wider responsibility to the young technical minds of this country.

To put it bluntly, you were wrong in your understanding of how a generator should be constructed with regard to the correct orientation of the commutator. A lot of your readers have tried so very hard to explain the correct situation to you, and yet with each of your successive contributions you seem to have dug a deeper hole for yourself. The time has now come to do the honourable thing and to admit you were wrong. You should set out the facts correctly, especially for the young readers of EA.

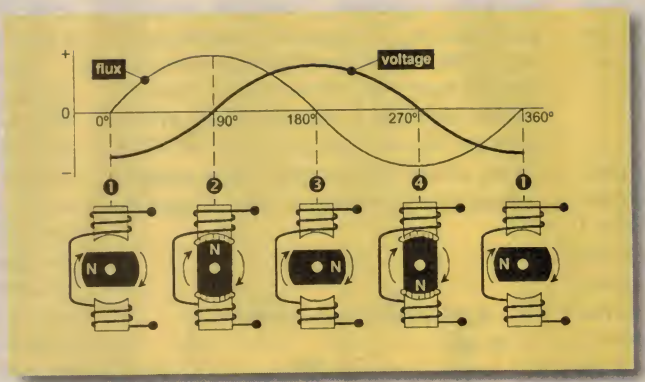


Fig.1: This diagram shows the relationship between magnetic flux, output voltage and the position of the rotating magnet relative to the coils.

I have taught thousands of young people who have come to my university with an incorrect understanding of many key aspects of technical matters. I have always been generous enough to consider this to be the result of genuine misunderstandings. Please don't make me think there are teachers (I recall you saying you were once one yourself) that have some of these concepts wrong. (K.E. Moxham BE(Hons), PhD, MIEAust, CPEng, NPER3)

Unfortunately Dr Moxham, there *are* teachers, writers and educators out there who don't always get it right, even on basic concepts like magnetism. When I was researching the content of my electrical text books, I found considerable disagreement between authors on many topics, and I've yet to find an author on electronics or electricity who I *can* really trust. Sure, they might get it right 99% of the time, but there's usually a mistake somewhere. And I guess as an author, I'm no different, despite my best attempts.

So, if you are a 'young' reader, or someone just starting to learn about electronics, be warned: don't trust any single writer, not even me! Do your research if you really need to be sure of the facts.

Fortunately, given the number of kind readers who write to point out my errors, if you read this column regularly, you'll eventually get the right information. After all, the one promise I can make is that I'll always correct any mistakes. And on that note, do I need to do this now?

Experimental suspect!

The next part of Dr Moxham's letter deals with obtaining proof by experiment. As you might remember from the October 1998 issue, I built a small DC generator to show the relationship between the output voltage and the rotating magnets. But was my methodology correct?

A scientific principle states that you observe and think, you postulate an hypothesis, you then design an experiment or test that is specifically aimed at both proving and disproving your working hypothesis. You then contemplate the observations. Simple observation of something, without a proper understanding can be unhelpful.

Your experiment was poorly constructed in an intellectual sense. It is silly to not take into account simple mathematical modelling of a useful generator, the old Pixie machine, the simple loop referred to by Mr A. Torrens and the machine you've designed. All these machines have a magnetic circuit and windings that have induced EMFs. They will only have much in common when there's a very small current in the windings. Your machine would have had a very poor magnetic circuit with a large air gap. To have obtained a reasonable voltage you have placed many turns on the 'armature'. This in turn has created a high inductive series impedance. When almost short-circuited (as it effectively was with your 100Ω resistor), you are simply observing the almost 90-degrees phase shift between the current (the voltage you have measured across the 100Ω resistor) and the voltage (the induced EMF).

Dr Moxham's letter continues in a similar way, ending with: *I don't know what more to say other than to beg you to stop your unhelpful explanation about generator commutators, and to set the records straight.*

Alternator output

While I accept my alternator is a pretty slack design, I don't agree the results I obtained are meaningless. I wrote in October: 'While I haven't drawn waveforms to show it, I also found the value of the load resistor determines the phase relationship of the output voltage to the position of the magnet. Obviously inductance is playing a role here. Therefore, to convert the output voltage to DC, the relationship of the commutator to the magnet depends on the value of the load'. This is also supported by other readers. However, let's summarise the information, which I hope finally puts the records straight:

1. The diagram in Fig.1 is correct for an unloaded alternator. That is, you get minimum voltage when the magnets are in line with the coil pole pieces, as the rate of change of the flux is at a minimum.
2. When an alternator is loaded, the relationship between output voltage and magnetic flux is different from the unloaded case. The extent of this difference depends on the design of the alternator.
3. As the Pixii generator is a poor design (like my experimental device), it's difficult to tell what the loaded relationship is. However, it will be different from the unloaded relationship.

Notice that I'm saying my alternator is more like the Pixii generator than a typical generator, which is what the whole topic was about. However, like some other topics we've had over the years, this one got out of hand and ended up being mistaken as an in-depth discussion on conventional DC generators. But, hopefully we've got there at last.

Now I want to clean up another topic, which you'll be relieved to know is about electronics...

Input resistance

This topic goes back almost a year, and arose when I presented the circuit of Fig.2 as a What?? question, asking for the input resistance at terminals A and B. The circuit was drawn incorrectly, and should have had R4 connected to ground, not to the op-amp output. To salvage the situation, I postulated that the input resistance would change with the supply voltage, and presented the question again, this time with the correct diagram.

But quite a few readers were not happy with my suggestions about the circuit. I'm still getting the occasional email about it, and I'm sure there's a few readers who think I've dismissed their comments. So, let's quickly revisit the question, but this time with a different and more appropriate focus.

As I explained in the April '98 issue, to prove my hypothesis, I built the circuit. It performed as I'd suggested it would, but in my explanation I should have made it clear that the equivalent circuit did not need the op-amp. Because its output will only ever be at either +Vcc or -Vcc (e.g., +12V or -12V), all the op-amp is doing is providing a supply voltage to two resistive networks. The equivalent circuit is in Fig.3, with the supply voltage depending on whether the op-amp output swings negative or positive at power-on.

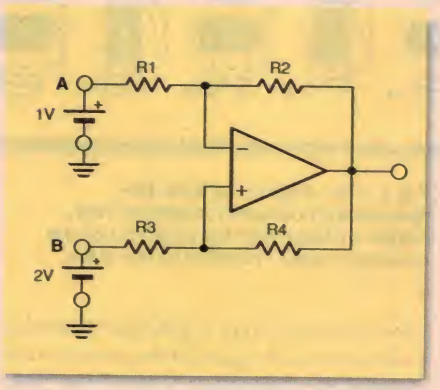


Fig.2: The op-amp circuit as presented. The equivalent circuit is in Fig.3.

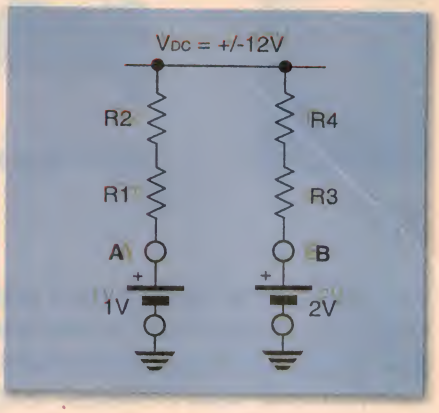


Fig.3: Equivalent circuit of Fig.2. The voltage applied to the circuit is either positive or negative, depending on the op-amp conditions at switch-on.

For a basic resistive circuit like Fig.3, input resistance (or impedance as some readers insisted) is as meaningless as amplification. Forget the op-amp; it's simply a voltage source. Forget input resistance (impedance), as the circuit boils down to two independent circuits containing a battery (the input signal source) and two series resistors. With a positive supply voltage, the batteries are charged by the circuit. For a negative supply, the batteries discharge. And that's it, folks! Nothing tricky, just a simple DC resistive circuit.

Benefits of controversy

Given that this month's column is rather special, I hope you'll let me indulge myself by concluding the above discussion with the following letter. It arrived just in time to be included, and I think it makes some very good points.

I would like to offer a few words of encouragement in regard to your column, which I have been following almost from its first day. I don't think I could add up the value of the interest and knowledge I have gained from it. Of course, from time to time I have disagreed with some things in the column — for example, I did not agree with you as to the optimum position for commutation in the case of the Pixii generator, and I wrote to tell you my reasons for that. Apparently a number of other people also didn't agree, and you were generous enough to publish various letters reflecting that view.

I was stimulated as a consequence of the resulting controversy to look up some reference books on the subjects of generators and magnetism, and I learnt a lot as a result. Perhaps the most important thing I learnt was that it's a mistake to assume I know something, because more likely than not, I know less than I think I know. To quote a famous epigram (which I just made up):

"It is not his acquired knowledge, nor even

his wisdom, that is the measure of a man, but his unquenchable thirst for new knowledge, his burning desire for new understanding and his eternal search for truth that characterise the true wisdom of a man".

Some people might think that controversy is bad, but it's the lack of controversy we should fear. Because without controversy there's no doubt, and without doubt there's no curiosity; and without curiosity there is no discovery. Controversy is but one facet of discovery, and discovery is the essence of growth in us all.

To me, your column endeavours to aspire to more than just providing information. It seeks to make its readers think, and it invites them to respond. This sets your column above the level of mere news, projects or circuit ideas, and should therefore be applauded. As long as it continues to maintain that aspiration I, for one, will continue to follow your column with interest. In the immortal words of Spock: live long and prosper". (Herman Nacinovich, Gulgong, NSW)

Thank you Herman, it's great to get such encouragement, especially on my tenth! Be assured, I'll be trying to maintain as much stimulus as possible in future columns.

And how too can I add up the value I've got from conducting the column? I've learnt a great deal from you, the readers; I've made many friends, and I've enjoyed it all immensely. Now let's talk briefly about you: the reader.

Our readership

Letters to this column come from hobbyists, students, educators, doctors, servicemen, engineers, mathematicians, scientists and, of course readers with a general interest in electronics. While the bulk of our readership resides in Australia, we also get letters from readers from New Zealand, England, USA, India and other countries.

It's difficult to estimate how many people read the column, but given the large amount of mail I receive when I make a mistake, it's reasonable to say the column is widely read. For example, I received nearly 200 emails, letters or faxes about the battery capacity error. So when your letter is included in the column, be assured it will be read by a lot of people.

Special readers

There are a number of special readers I'd like to acknowledge, particularly those who regularly contribute interesting material to the column. I can't name you all, but please accept my sincerest thanks for your continuing support.

Your letters

I receive letters, faxes and emails, but let's call them all letters. Here's how I handle them, and how I select a letter for use in the column.

All letters are mailed to me from the magazine head office, and on receipt I file them carefully. I read each one before filing it, and where possible, identify the topic most readers are writing about to open the column with. I then find all letters on that topic (including those I've had on hand for some time), go through them all, and choose the best ones.

From there, I use your letters as quickly as possible, using those I think other readers will be interested in. So I can group information on a particular topic, rather than spread it out randomly, I aim for a different theme each month, such as automotive, TV, computers. This means however that your letter might not appear for a few months after I've received it.

As well, there's our two-month lead time. You're reading this in January 1999, but I'm writing it early in November 1998. This also explains why sometimes I haven't responded to a topic in the following month. The shortest response time from you reading the column to appearing in it is two months. A typical response time is three months. Snail mail! But at least you can read this on the train going to work...

Replies

As there's usually quite a lot of letters, I can only reply to those readers whose letters I'm using in the column. I do this religously, unless there's no return address. I also reply to emails from my home computer. I don't mind receving emails in reply to mine, but unless you ask, I usually don't respond.

A special reply

Conducting this column has been a learning experience for me, especially of course in technical issues. For example, you all put me straight on battery capacity, and I've now got a few things sorted out about alternators.

But there's one thing I need to do: let Ian Dalby know he was right. It was Ian's question about battery capacity that started the events detailed in November. You see Ian, I've lost your letter, so I no longer have your address. Hence this special reply. We've also decided to award you the prize this month, so if you'd like to send us your adddress, we can send it on to you.

What??

This month's question actually comes from the June 1975 issue of ETI. I've had it on hand for some time, but as there was no answer given to the question, I've delayed using it until I could solve it. I especially wanted to use it this month, as being in a nostalgic frame of mind, it seems appropriate to refer back to the magazine to which I contributed for nearly five years before joining what I believe is now one of the world's best electronic magazines. (Which lets me say many thanks to Jim and all the EA staff, especially our hard working sec-

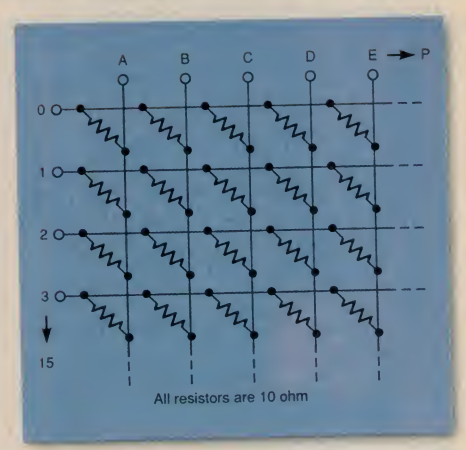


Fig.4: Find the resistance between lines B and C...

(Continued on page 75)

Win this great Contrib of the Month Prize!

As an added incentive for readers to contribute to this column, we're now offering a valuable prize to the question judged most interesting, or the answer/response judged most informative, each month. The prize is a Mod-Col 38/54 high-res PAL colour video camera module from sponsor Allthings Sales & Services, with 450 lines of resolution, built-in digital signal processing, electronic shutter and auto gain control — valued at over $400!

MARKETPLACE

FOR SALE

TOP QUALITY VIDEO CAMERAS * UP TO 730 DAYS WARRANTY * Hi-Res **SILICON CCD MODULES** only $59! **COMPLETE PACKAGED CCTV SETS** see p.31 EA Feb 98 only $249! ** **PREMIUM QUALITY MODULES** 400 + Line x 0.05 Lux SONY H.A.D. CCD & CHIPSET from $91** CAMERAS: Mini 36 x 36 from $88! Dome from $91! **COLOUR DIGITAL SIGNAL PROCESSING CAMERAS & MODULES:** **400 + Line from $180 ** DOME from $185! 480 + Line DOME with SONY CCD from $246! 600 + Line from $346! ** **OUR CAMERAS PRODUCE "NEAR SUPER-VHS" TO "BETTER THAN SUPER-VHS" QUALITY IMAGES** ** 50 LED DIY Infra Red Illuminators only $19! ACCESSORIES: 30 + Lenses 2.1 to 16 mm. FILTERS: Polarising, Coloured, Temperature Conversion, Infra-Red Cut & Pass for Image Enhancement, Colour Correction, Focus, Glare & Exposure Control. **ANCILLARY EQUIPMENT: QUADS** 4 pix 1 screen from $280. **PACKAGED SETS! QUAD + FOUR CAMERAS** + Power Supplies from $689! SWITCHER + FOUR CAMERAS + REG Power Supply from $508! **MULTIPLEXERS FULL-SCREEN FULL-RESOLUTION VCR** Recording / Playback from $826! **SWITCHERS 4 & 8 Ch** from $126! ALSO: Monitors, Outdoor Housings, Brackets, Dummy Cams, CCTV-TV/VCR Interface Modules, Motorised Pan Units etc. CCTV-TV/VCR 48 + Channel Crystal Locked Modulator/Mixer/Booster Modules from $14. CCTV Technical Reference Manual 400 + Pages $95 or FREE! **DISCOUNTS**: Based on ORDER VALUE, BUYING HISTORY, for CASH/ CHEQUE & NZ BUYERS! BEFORE you BUY Ask for our Illustrated Catalogue / Price List with Application Notes & Special New Enquiry Offer. **Allthings Sales & Services 08 9349 9413 Fax 08 9344 5905**

FREE PCB DESIGN SOFTWARE: WinBoard PCB Layout WinDraft Schematic. 100 to Unlimited pin versions from $5 or download from ME: http://www.me-au.com.

Rain Brain Sprinkler Kits: 8 station sprinkler controllers. 8 and 60 channel temp. monitors with PC Data logging. **Mantis Micro Products**, http://www.home.aone.net.au/mantismp

AUDAX High-Tech European Speaker Drivers from $11. **ME Technologies (02) 6550 2254**

Dontronics can be found at: http://www.dontronics.com

PC Display Splitter Kit $79 EA Jan98 Also sold built up QUESTRONIX Phone(02) 9477 3596

QUESTRONIX is located at: www.questronix.com.au/~questav Best value video gear

Speakerworks: Specialist in speaker repairs and parts D.I.Y. refoam kits: 3 1/2", 4", 5", 6", 7", 8", 9", 10", 11", 12" & 15" $39.95. Includes shims, dustcaps and adhesive. Largest inventory of cones, surrounds, gaskets, spiders, dust caps, grilles foam & cloth and 4,700 custom voice coils. Ph: (02) 9420 8121 Fax: (02) 9420 8131.

FOR SALE

SPICE SIMULATION - Send $5 for evaluation CD - demos, models & info on Intusoft SPICE products. ME Technologies PO Box 50, Dyers Crossing NSW 2429, Fax: (02) 6450 2341

PICTUTOR: Programmer board + 32 tutorials for PIC84. Other models available. E.S.T. (02) 9789 3616, Fax (02) 9718 4762

Amidon Ferromagnetic Cores: For all RF applications. Send business size S.A.S.E. for data/price to RJ & US Imports, Box 431, Kiama NSW 2533. Agencies at Assoc TV Service, Hobart; Truscotts Electronic World, Melbourne and Mildura; Alpha Tango Products, Perth; Haven Electronics, Nowra; WIA Equipment Supplies, Adelaide.

TEKTRONIX 100Hz 1GS/s Digital CRO plus FFT manuals, software, $2850, o.n.o. (08) 8244 5857

PC Control software/hardware for Windows (switch up to 64 relays) ideal for irrigation or security system. Phone (03) 6272 8880

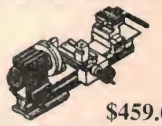
BUSINESS OPPORTUNITIES START YOUR OWN business or DIVERSIFY and gain NEW CUSTOMERS for your CURRENT BUSINESS. If you have a background in Electronics, Antenna Installation or Cabling this could be for YOU! Only requires a few hundred dollars to start. Mail details of your skills and/or current business activities to Opportunity PO Box 25, Northlands 6021

DAVICAD PTY LTD
Analogue/Digital Designs, Firmware, CAD Services and PC based Applications
From concept to the finished product, rescue of never ending designs or update of existing designs. Reliable, Affordable and On Time Services
Phone/Fax: (02) 9858 1085 obristw@dot.net.au
50 Cobham Ave, West Ryde NSW 2114
http://www.itech.com.au/davicad

ADVERTISING RATES FOR THIS PAGE
Small ads:
The minimum acceptable size of two centimetres x one column costs only $70. Other sizes up to a maximum of 10 centimetres are rated at $40 per centimetre.
Line classifieds: $6 for 40 letters. simply count the letters, divide by 40, and multiply by $6. Round up to the nearest multiple of $6
Minimum charge $12.
Please Note: We reserve the right to place Market Place ads throughout the main body of the magazine at our discretion, if space does not permit
Closing date :
Ads may be accepted up to the 10th of the month, two months prior to issue date.
PAYMENT: *Payment must be in advance by cheque, money order or credit card, include your name, address, and credit card details. Faxes accepted. emails accepted to: bbaker@hannan.com.au*
Payment should be sent with your advertisement, to:
The Advertising Production Manager
Electronics Australia,
P.O. Box 199, Alexandria, NSW 1435 Fax (02) 9353 0997

FOR SALE

PRINTED CIRCUIT BOARDS
Comprehensive details at
http://www.acetronics.com.au
eMail acetronics@acetronics.com.au

TAIG MACHINERY
59 Gilmore Crescent
GARRAN ACT 2065
Fax: (02) 6285 2763
Mobile: 015 269 742
Micro Lathe

$459.00

Mobile Phone Spares
Australia's leading supply of spare parts for mobile phones
• LCD's • Housing • Lenses • Flips • Speakers
• Microphones • Tools • Connectors
Call, Fax or E-Mail us for our latest price list
CENTRAL PARK ELECTRONICS P/L
P.O. Box 1030 Central Park, Victoria 3145
Phone (03) 9563 5385 Fax: (03) 9563 5822 cellular@mail.com

Printed Circuit Board Manufacture
48-Hour service • High quality • Low prices
1 offs to any quantity
Artwork designed if required
Call for obligation free quote...
INSTANT PCB'S PO BOX 448 AVALON 2107
Ph: (02) 9974 1189 Fax: (02) 9974 5491

Jaycar ELECTRONICS
We are always looking for enthusiastic staff for positions in our Retail Stores & Head Office at Rhodes in Sydney. A genuine interest in Electronics is a necessity.
PHONE 02 9743 5222
for current vacancies

INDUSTRIAL ELECTRONIC SERVICE
custom design to production, prototyping repairs to electronic equipment + power supplies
CAMPAD ELECTRONICS
PO BOX 269 CAPALABA QLD 4157
ph (07) 3245 2008 fax (07) 3823 3428

TRUE RMS DMM
Includes
Capacitance
Frequency
Min/Max reading
Bargraph
Auto range

$98.00 ex tax
Computronics Corporation Ltd
6 Sarich Way, Technology Park, Bentley, WA, 6102
Ph. 08 9470 1177 Fax 08 9470 2844
Specifications at www.computronics.com.au

(Continued from page 73)

retary Ana Marie, who always makes sure I get your letters.)

Now for the question, which I note was incorrectly presented in ETI:

A 16 x 16 matrix has 10Ω resistors connected across intersections, as shown in the partial drawing in Fig.4. What is the resistance between lines B and C? And to keep you busy, what is the resistance between lines 0 and A? (This is how the question was posed in ETI, but I think you'll find it quite difficult to solve.) If you want still more, repeat the above questions for an 8 x 8 matrix of 10Ω resistors.

Answer to December's What

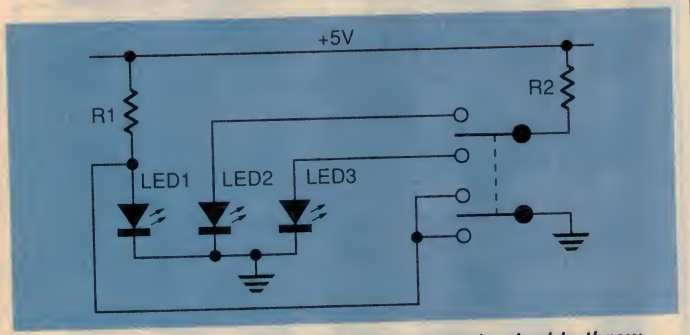


Fig.5: Switching three LEDs with a double-pole, double-throw, centre-off switch.

The circuit is shown in Fig.5. Notice that when the switch is at its centre-off position, LED1 lights via R1. For the other two switch positions, LED1 is shorted by the switch, and either of the other two LEDs are on, depending on the switch position. ❖

Electronics Australia **is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here are some interesting items from past issues:**

50 years ago

January 1949

World's Biggest Telescope: After 20 years of planning and construction work, the 200-inch telescope at Mt Palomar, California is now being turned to probe riddles that have previously been beyond the range of astronomical investigation. Twice as large as its companion at Mt Wilson, 90 miles from Palomar, the new telescope will push back man's celestial horizons to new limits. Its giant eye has a range of 1000 million light years.

Now named the Hale telescope in honour of the distinguished American astronomer Dr George Ellery Hale, who died 10 years ago, the new instrument has cost $6,500,000. The 200-inch mirror, the biggest glass disc ever cast, necessitated the building of a furnace 30 feet in diameter. Into this 40 tons of raw materials were placed and kept for three weeks at a temperature of 2800°F. After pouring the mixture into a specially prepared mould it was allowed to cool very gradually before shipping to the Californian Institute of Technology for grinding and polishing.

The building which houses the giant telescope stands 10 storeys high. The telescope, with its mounting and fine precision control, weighs 500 tons.

25 years ago

January 1974

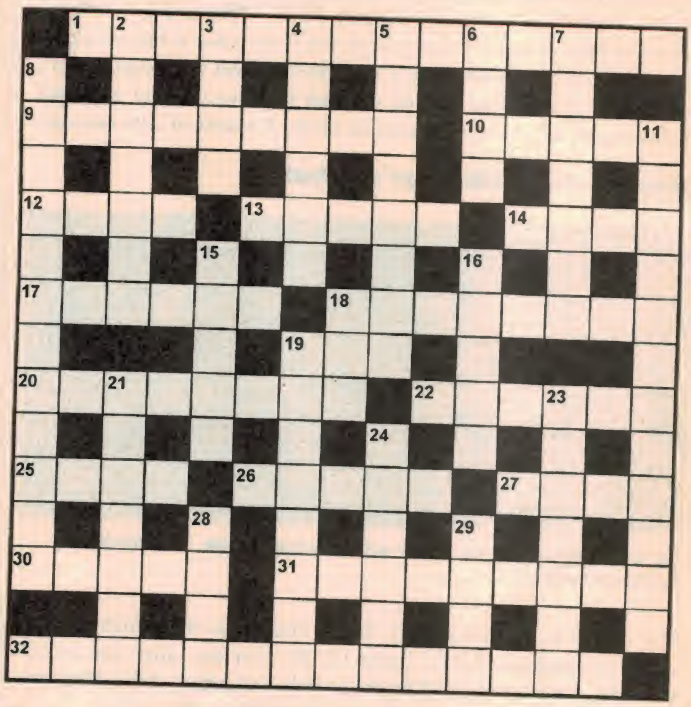
Pioneer 10 Jupiter Probe Successful: Man's first spacecraft to the planet Jupiter reached the giant planet on December 3, after a 1000-million kilometre journey that began approximately two years ago. Pioneer 10 approached Jupiter at a distance of 131,400km, taking pictures of the brightly-coloured planet and returning physical data that will provide scientists with new information on Jupiter.

Pioneer 10 is now heading out of the solar system. It will cross Saturn's orbit in 1976, Uranus' orbit in 1979, Neptune's orbit in 1983 and in 1987 (15 years after its launch) the orbit of Pluto, the boundary of the solar system.

Superconducting Magnet Suspends Train: A prototype of a wing-type superconducting magnet capable of magnetically suspending a 500km/h (300mph) super high speed train has been completed by the Tokyo Shibaura Electric Co (Toshiba).

The device has been test-manufactured by Toshiba in accordance with the Japan National Railway Corporation's plan to run a 500km/h super high speed train between Tokyo and Osaka, Japan's two largest cities, in the 1980s. The new superconducting electromagnet is only 24cm thick, thus enabling it to be fitted beneath the body of a train. ❖

Crossword



Across

1 Medical treatment using current methods. (14)
9 Nature of Jindalee radar system. (4,5)
10 Part of a video or movie. (5)
12 People in a spacecraft. (4)
13 Element 100 is named after this physicist. (5)
14 Quality of sound. (4)
17 In haphazard sequence. (6)
18 Said of continuous, in-phase radiation. (8)
19 Major source of energy. (3)
20 Inventor of cyclotron. (8)
22 Generator of current. (6)
25 Activate a switch. (4)
26 Indicative label for a control switch. (2-3)
27 Flexible metallic conductor. (4)
30 Placed in a chosen position. (5)
31 Result of frequency matching. (9)
32 The study of charge behaviour. (14)

Down

2 Casing of a light source. (7)
3 Complete a formative process, e.g. glue. (4)
4 Bell component. (6)
5 Particle emitted by incandescence. (8)
6 European Telecommunications Standards Institute. (1,1,1,1)
7 Useful solvent. (7)
8 Liquids in wet cells. (12)
11 Instrument for measuring a potential difference. (12)
15 Material used in laser printer, photocopier. (5)
16 Silicate ore of Be. (5)
18 Alerting situation. (3)
19 Outline of movie scene. (8)
21 Developer of jet engine (1907-96). (7)
23 Concerned with negative particles. (7)
24 A compensating equivalent, or address adjustment. (6)
28 Revise and correct a video film, etc. (4)
29 Unit of speed. (4) ❖

December's solution:

A	F	T	E	R	G	L	O	W		D	I	G	I	T
R		H		O		A		A		I		I		R
T	H	U	N	D	E	R		V	I	S	I	B	L	E
I		L		S		G		E		H		B		M
S	K	I	N		W	E	I	G	H		S	O	L	O
A		U		T				U		U		U		R
N	U	M	E	R	I	C		I	O	N	I	S	E	S
			A		A	M	D		I					
G	A	L	L	I	U	M		E	U	T	E	X	I	A
R		I		L		C				S		P		M
A	U	N	T		L	O	O	P	S		C	L	I	P
V		D		M		R		R		F		A		E
I	R	E	L	A	N	D		E	M	I	T	T	E	R
T		C		S		E		S		F		E		E
Y	O	K	E	S		R	E	S	P	O	N	S	E	S

Electronics Australia's

Professional Electronics

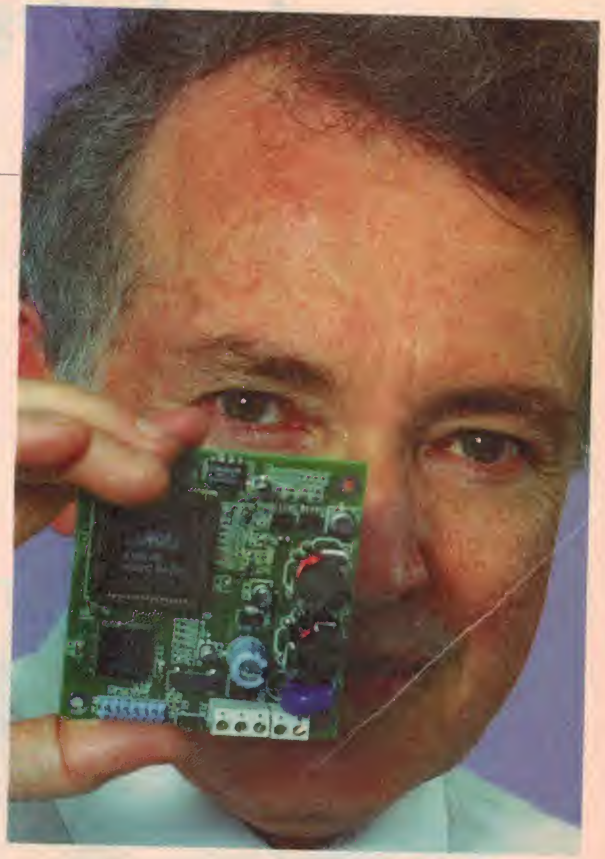
UTS researchers unveil prototype module for future digital energy meters, read remotely via the power lines

Victoria buying 37,000 laptop PCs for its teachers

Review of Terratec's 'Base1' high quality sound card for multimedia PCs, and two audio restoration packages

On the 100th anniversary of magnetic recording, IBM announces its 25GB hard disk drive for desktop PCs: 2500 times the capacity of the PC's first drive!

highlights News



UTS researchers develop PLC-read energy meter

RESEARCHERS FROM the University of Technology, Sydney (UTS) have revealed the first working prototype of a new electrical energy meter-box electronics module which is believed could usher in a new era of computer-controlled electricity supply. The compact microprocessor-based module is capable of recording vital consumer information and digitally relaying it to the electricity provider in seconds, via a refined form of Power Line Carrier (PLC) technology developed by UTS.

The module will be used to launch a new digitally-controlled communication network using the mains electricity wiring. The network, considered a mandatory pre-requisite to privatisation, will allow the industry to obtain up-to-the-second digital readings of consumer usage, rather than relying on the traditional method of manually collecting a reading from every household meter.

"We have pioneered new PLC techniques to enable signals to be sent from each household meter to the electricity provider company over the electricity supply network", explained chief researcher Professor Warren Yates. "What this means is that eventually households will be equipped with much better and more versatile electric meters, that will enable local industry, which has dominated the electricity meter market, to remain competitive."

"It will be possible to send minute-by-minute tariff changes to the home, to extend the concept of off-peak rates, as well as read the meter in a fraction of a second by people located at a distant central point, or by computer."

The network operates by sending a low-frequency audio signal from a 'master' computer located at the electricity supply company's head office or a nearby sub-station, to a specific household. The signal requests data from the module, which reacts by digitally transmitting the required information back along the power line to the master computer, where it is processed.

Unlike the highly visible introduction of pay TV cables, the electricity industry's new communication network will run invisibly along existing power lines, Professor Yates said.

The release of the prototype is claimed to represent a significant breakthrough in what has been a long-term research effort between UTS, Email Ltd and several major electricity supply companies including Energex (Queensland) and Energy Australia (NSW), with funding from the Australian Research Council.

Victoria's teachers getting laptop PCs

THE VICTORIAN Government is investing $100 million over the next five years to ensure that teachers in all public schools throughout the State gain the benefits of ready access to notebook computers. In what is believed to be the second largest tender for laptop computers in the world, the project involves purchasing 37,000 laptops, the first third of which were delivered to teachers late last year. Acer Computer is supplying 85% of the computers as IBM compatibles, in an order worth $67 million, while Apple Computer Australia is supplying the remaining 15%.

"These computers are vital components of the Government strategy to expand the use of information technology and multimedia in the delivery of curriculum to our students", said Minister for Education Phil Gude. "Our aim is to support and encourage principals and teachers to effectively integrate the use of learning technology into the classroom and administrative practices of schools."

As a result of its successful bid with the Education Department of Victoria, along with other recently won government business nationally, Acer Computer Australia is expanding its federal industry development programs. Agreement has been reached with Multimedia Victoria to give Victorian companies and institutions 'first right of refusal' for any new activities. These new industry development programs will be structured around the key areas of R&D, manufacturing, software development, services and multimedia production.

In November, the Victorian Department of Education began taking delivery of Acer Extensa 500T notebook PCs. They are configured with an Intel Pentium 233MHz processor with MMX, 32MB SDRAM, 3.5GB hard disk, 2MB video RAM, 12.1" TFT screen, 20x CD-ROM, 16-bit Sound Blaster Pro-compatible sound card, twin speakers, Xircom RealPort 10/100 Ethernet card and an internal 56kb/s fax/modem. Two NiMH batteries are being supplied with each machine.

Lucent completes acquisition of JNA

LUCENT TECHNOLOGIES, through its subsidiary Lucent Technologies Australia, has completed its acquisition of JNA Telecommunications — a major Australian supplier of data networking and telecommunications systems and services to industry, government and service providers for the past 37 years.

Lucent will continue to distribute JNA products in Australia in addition to making them more widely available in the global market. JNA's R&D capabilities will be integrated into Lucent's Bell Labs R&D community over time, and will jointly develop technology for

Australia as well as the world market.

"Lucent is a global leader in key technologies that are changing the way we live and work — including wireless, optical and data networking, switching and access technologies, network products and communications software", said Peter Davies, MD and chief executive of JNA Telecommunications. "JNA is pleased to join forces with an entrepreneurial and growing company whose Bell Labs breakthroughs stand for innovation the world over." Davies will continue to lead the former JNA company, which has become a part of Lucent Australia.

The acquisition of the JNA company significantly expands Lucent's presence in the Australian market by adding 240 very experienced people — over 100 of whom are engaged in R&D.

AMD reveals K7 processor details

ADVANCED MICRO DEVICES has disclosed design and technology details of its forthcoming AMD-K7 microprocessor, the successor to its successful K6 processor family.

"We are excited to give the industry a first look at our seventh generation processor. The all new AMD-K7 design features a number of compelling technological breakthroughs, including the industry's first mainstream 200MHz system bus and the most architecturally advanced floating point capability ever delivered in an x86 microprocessor", said S. Atiq Raza, AMD executive VP and chief technical officer.

The Microsoft Windows compatible AMD-K7 processor with 3DNow technology offers innovations including a nine-issue superscalar microarchitecture optimised for high clock frequency, a superscalar pipelined floating point unit, 128KB of on-chip level one (L1) cache, a programmable high-performance backside L2 cache interface, and a 200MHz Alpha EV6-compatible system bus interface with support for scalable multiprocessing.

The K7 processor is expected to be available in the first half of 1999 and is planned to operate at clock frequencies faster than 500MHz, based on AMD's 0.25-micron process technology.

Year 2000 Churchill Fellowships

THE CHURCHILL TRUST is calling for applicants from all walks of life for Churchill Fellowships, to be awarded in 1999 for travel in 2000. The fellowships provide an opportunity to undertake overseas study, or an investigative project, of a kind that is not fully available in Australia. All Australians over 18 are eligible.

Features include overseas travel for about three months (more if appropriate), with fares, fees and a living allowance paid, to an average value of about $15,000. The Fellowships open many doors, and also provide the satisfaction of contributing to Australian society.

The closing date for applications is 28 February 1999. Forms are available from The Winston Churchill Memorial Trust, 218 Northbourne Avenue, Braddon ACT 2612; phone (02) 6247 8333 (website **http://sunsite.anu.edu.au/churchill_fellowships**).

Vale Ken Laird

KEN LAIRD, the founder and principal of Melbourne firm Kalex Electronics, has passed away at the age of 82.

An auditor by profession, Mr Laird started steel merchants K&A Laird at Yarraville after World War 2. A large family business, it is still operating to this day. Kalex Electronics was started in 1979, as a hobby business for his retirement. Initially it was a retail/wholesale shop in Burgundy Street, Heidelberg, then a second shop was opened in Melton. The business became wholesale-only in 1988, and then operated only out of Ken's home in leafy East Ivanhoe.

Mr Laird was very skilled at computer programming and wrote many special programs for his business because he couldn't buy suitable programs off the shelf. He spent a lot of his time on the phone helping young people and educators with advice, encouragement and ideas to solve technical problems. The business was built on this type of personal service, and current manager Sue Lee is continuing with this tradition.

This new ultraviolet water disinfection system from The Netherlands is claimed to provide permanent, chemical free deactivation of water-borne microorganisms without the need for extensive additional pipework. It uses a wide-spectrum UV tube and is available from ANCO Australia: phone (02) 9748 3544.

Jaycar's 1998 Dealer of the Year

JAYCAR ELECTRONICS WHOLESALE has announced that the winner of its 1998 Dealer of the Year award is Newtek Electronics, of Wollongong.

The award was based on outstanding sales and service to the Illawarra region, and was earned by sales person Geoff Howell (left in photo) and proprietor Jack Dececso (right). Newtek carries a broad range of Jaycar products and is located at 348 Keira Street, Wollongong; phone (02) 4227 1620.

News highlights

Rocket eBook gets publisher support

NUVOMEDIA Inc's Rocket eBook electronic book has been released on the US market, and many of the leading book publishers have announced their support for it as charter publishers.

"This is a momentous day, not just for NuvoMedia but for book lovers everywhere", said the company's cofounder and CEO Martin Eberhard at the launch — held at the New York city flagship store of Barnes & Noble. "We have taken a favourite pastime, reading, and brought it into the future. With the overwhelming support of the publishing community, which is supplying a wealth of titles for eBook readers to enjoy, the promise that electronic books hold is now a reality."

Among the charter publishers who have announced their support of the Rocket eBook are Addison Wesley Longman, Bloomberg Financial Markets, Farrar, Strauss & Giroux, HarperCollins Publishers, Harvard Business School Press, Henry Holt and Company Inc, Macmillan Computer Publishing USA, McGraw-Hill Publishing, O'Reilly & Associates, Penguin Putnam Inc, Random House Inc, Simon & Schuster, St Martin's Press, Tor Books and The Wall Street Journal Interactive Edition.

The Rocket eBook is priced at US$499 and can be ordered online from Levenger (web site **http://www.levenger.com**). More information on the eBook is also available at NuvoMedia's site at **http://www.rocket-ebook.com.**

Intel releases 300MHz mobile Pentium II

BUILDING ON the broad and rapid market adoption of mobile PCs based on its Pentium II processor, Intel Corporation has introduced a higher performance mobile Pentium II processor. The new mobile 300MHz Pentium II offers mobile PC users a performance boost while preserving system battery life.

Mobile Pentium II processors are designed to address the unique physical size, thermal and power consumption requirements of mobile PCs. For example they incorporate Quick Start technology, which drops the processor power consumption to 0.4 watts when the mobile PC is idle or inactive, to extend battery life.

The new 300MHz mobile Pentium II processor is based on the same P6 microarchitecture, packaging and thermal specifications as the 233MHz and 266MHz mobile P-II processors, so no new system design engineering is required for PC makers to incorporate it into new mobile systems.

Based on the industry standard benchmark Winbench98 CPU32, the new chip posts a 9% integer performance improvement over the Pentium II processor 266MHz. It also achieves a 6% improvement on Winstone98 and a 12% improvement on Winbench98 FPU. Manufactured on Intel's advanced 0.25um process technology, it includes performance enhancing features such as: Dual Independent Bus architecture, Dynamic Execution, Intel MMX technology and a closely coupled 512KB Level 2 cache.

Intel's new 300MHz mobile Pentium II chip, whose core runs from only 1.6 volts.

Intel has reduced the internal core voltage of the mobile 300MHz Pentium II processor to 1.6V, resulting in the company's lowest voltage mobile processor introduced to date. The processor core generates 7.8 watts TDP (thermal design power) typical and with the addition of the second level cache, the processor operates at 9.0W.

Radio amateurs to lose frequencies during 1999, 2000

RADIO AMATEURS in the Sydney basin will lose the use of UHF band frequencies between 421MHz and 432MHz for the period from 31 March 1999 to 31 December 2000, as they are required for the Olympic Radio Network (ORN) to accommodate the period of the Olympic Games and the extensive SOCOG lead-up testing schedule.

The ORN will be a distinct trunked radio network of at least 200 channels, especially created to support the staging of the Games. Telstra has been contracted to implement the ORN and is currently planning the installation and support of the network on behalf of SOCOG. A trunked land mobile system using Motorola's 'Astro' forms the basis of the network. Astro is a four-level FM QPSK digital trunked land mobile technology closely related to Motorola's Smartzone trunking system (which provides the basis of the NSW Government Radio Network).

The necessity for further restrictions outside the range 420 - 433MHz and beyond the Sydney basin are yet to be determined. Additional work is still required to explore the potential for mutual interference between the ORN and amateur narrowband communications within the range 431.95MHz and 433MHz.

IN BRIEF

- The *1999 International Electronics Show* (CES), claimed as the world's largest annual trade event, will be held on 7 - 10 January 1999 in Las vegas, Nevada. This year's event is planned to have over 1900 exhibitors occupying more than one million square feet of exhibit space spread between the Las Vegas Convention Center, the Sands Expo and Convention Center, the Las Vegas Hilton and the Alexis Park Hotel. Intending attendees can find out more and also register online at http://www.CESweb.org.
- The *15th International Computer Exposition* (COMPUTER '99) will be held from May 13-16 at the Hong Kong Convention and Exhibition Centre. It is expected that 180,000 visitors will tour the 13,000 square metre exhibition area. For more information contact Business & Industrial Trade Fairs Ltd, phone (852) 2865 2633 or fax (852) 2866 1770. ❖

Central Coast Field Day

THE CENTRAL COAST Amateur Radio Club will be holding the 42nd annual Field Day on Sunday 28 February 1999, at Wyong Racecourse, Howarth Street, Wyong. This long established event is the largest of its kind in the southern hemisphere, and provides an impressive array of sales stands by commercial traders, as well as displays by clubs and special interest groups.

Other features of the Field Day are technical seminars and the traditional 'boot sale', where private traders offer a wide range of pre-loved equipment.

For more information contact Bob Fitzgerald VK2XRF, CCARC Field Day Organising Team, PO Box 327, Ettalong Beach NSW 2257 (or look at their web site at **http://www.ccarc.org.au**).

Siemens I&C splits into three

SIEMENS HAS revealed local details of its worldwide changes in information and communications (I&C), involving some 1100 of its 2000 people in Australia and New Zealand. The company is now operating through three closely coordinated business units in the I&C sector:

- Information and Communication Networks, providing 'end-to-end solutions' for managed voice, data and mobile networks;
- Information and Communication Products, developing and marketing globally competitive, high-volume products, including personal computers and mobile phones; and
- Siemens Business Services, delivering a range of professional I&C services including business process consulting, as well as design-build-and-operate capabilities for fully integrated solutions.

In Australia and New Zealand, the three new business units now operate under the responsibility of Siemens Ltd. They come from the former activities of the Telecommunication Division of Siemens Ltd, Siemens Nixdorf Information Systems Pty Limited and Siemens GEC Communication Systems Pty Ltd. The other activities of Siemens will continue in the sectors of industry, energy, transportation, components, medical electronics and lighting.

Renamed Mitec focussed on exports

BRISBANE-BASED microwave technology maker Mitec Ltd has been renamed as Codan (Qld) Pty Ltd, to reflect its new ownership and a new focus on increasing export sales. Mitec has been a wholly owned subsidiary of the Adelaide-based Codan Group after Codan's successful takeover bid in 1997 and Mitec's subsequent delisting from the Australian Stock Exchange. According to Codan (Qld) general manager Barry Pentland, the name change reflects the synergies of both companies and the increased sales they can achieve together in domestic and global markets.

"Codan has strong global sales, with 85% of its revenue generated in export markets. Mitec's major achievements are in domestic sales. By assimilating the two companies, through this name change, we will be able to leverage off the Codan name to get increased export revenue from products made by Codan (Qld)", he said. "We can also improve domestic sales through markets developed by Mitec, but our core focus is on improving export revenue."

What were previously Mitec's satellite communication products and digital microwave links have already been rebranded and are being exported into markets familiar with the Codan name. Codan sells its products in more than 150 countries.

Mitec's D-Series microwave radio has been improved and relaunched as the Codan 7700 radio. "The new 7700 can now operate in more extreme environmental conditions", said Tony Reading, Codan (Qld) sales & marketing manager.

According to Barry Pentland the combination of the Mitec and Codan companies will mean greater spending on research and development. "The financial security of the strong, profitable Codan group means we are able to invest more into product development and customer service", he noted.

In Germany, Mercedes-Benz has released the first fuel cell powered low-platform bus, based on a fuel cell developed at the Daimler-Benz Research Centre. The technology is expected to provide economical operation in the new millenium. (IN-Press/Daimler-Benz)

Some 85% of Codan's current $65 million a year sales revenue is from exports; Codan (Qld)'s contribution takes that to around $80 million, the majority of which is from domestic sales.

"The goal is to achieve 80% export sales for Codan (Qld) with no loss of revenue from domestic markets", Mr Pentland said.

VAF speakers used in Festival Theatre

INNOVATIVE SPEAKER systems with an extremely even and uniform power response were designed and manufactured by South Australian firm VAF Research, to form a key part of the new LARES electro-acoustic sound system installed in Adelaide's Festival Theatre, in order to solve the Theatre's long standing acoustics problems.

Festival Theatre had been receiving complaints about its poor acoustics for many years, and decided to seek a solution as part of the Theatre's 25th Anniversary overhaul. They selected the LARES (Lexicon Acoustic Reinforcement and Enhancement System), which has been used to solve similar problems in famous theatres such as the Vivian Beaumont drama theatre in New York's Lincoln Performing Arts Center, Amsterdam's Muziektheater, Berlin's Deutsche Staatsoper and Vienna's Volksoper.

LARES uses three pairs of special high-quality microphones, placed over the first rows of auditorium seats, behind the proscenium arch and further upstage. All signals are then converted to the digital domain and passed through a signal processing system which creates a set of output signals with carefully profiled artificial delays and reverberation. These signals are then fed through 50 four-channel amplifiers, with a total capability of 40kW, to some 287 speaker systems built into the walls and ceilings of the stage and auditorium areas.

VAF Research founder and chief designer Philip Vafiadis said the design of the special speakers needed for the system was quite a challenge, but turned out to be very successful. Hopefully the achievement will place VAF in a good position to supply speakers for future applications of LARES. ❖

Win a *superb* Hewlett-Packard Infinium oscilloscope

valued at $20,813!

That's right — subscribe or renew your subscription to Electronics Australia NOW, for 12 issues at the discount price of $55 (saving $16.40 on your normal cover price), and you'll be automatically entered into the draw to win a Hewlett-Packard 54810A Infinium Oscilloscope, valued at $20,813 (RRP).

HP's new Infinium family of oscilloscopes employ leading-edge technology to achieve outstanding levels of performance, combined with intuitive ease of use. They provide the very latest digital sampling, signal processing and display technology, together with an internal PC with customised Windows 95 graphical user interface. This allows you to not only set up the scope faster and more confidently than ever before, but also to save and recall both setups and measured waveforms — and also transfer them to your PC, for use in documents and reports. The inbuilt Windows GUI is mouse-driven and very intuitive, and even includes a full on-line, context sensitive help system — so there's no need for the traditional weighty user manual!

CONDITIONS OF ENTRY:

1. The competition is open to Australian residents authorising a new or renewed subscription to Electronics Australia magazine. Employees of IPMG, Hewlett Packard, their subsidiaries and families are not eligible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on October 12, 1998 and closes last mail on February 23, 1999. 5. The draw is at the promoter's premises on March 2, 1999 at 11 am and the winner will be announced in The Australian, issue date March 4, 1999, and notified by mail. In the event of any unclaimed or unwanted prize, a second chance draw will be conducted on June 23, 1999, subject of Reg. 37 of the Lottery & Gaming Regulations 1993 (SA). 6. The prize is a Hewlett Packard Oscilloscope valued at $20,813 rrp. 7. Total prize value $20,813 rrp. 8. The promoter is FPC Magazines, 180 Bourke Road, Alexandria, NSW 2015. 9. All entries become the property of FPC Magazines, and may be used for future marketing purposes.
NSW permit No. TC98/7908; VIC permit No. 98/3626 issued on September 30, 1998; ACT permit No. TP98/0953; SA permit No. pending; NT permit No. pending.

TO SUBSCRIBE:

CALL 1300 656 933
(call charged at local call rates)
- with your credit card details ready

FAX (02) 9353 0967

Cut out or photocopy this coupon and send to:
Reply Paid No.3
FPC Magazines
PO Box 199, Alexandria
NSW 1435 (no stamp required)

WE'LL RUSH YOU THE FIRST AVAILABLE ISSUE.
Any queries about your subscription? Call our customer service line on (02) 9353 9992.

Code No: ELT OSC 11"99

HURRY! OFFER ENDS FEBRUARY 23, 1999

The most valuable prize we've ever offered!

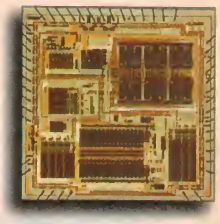
Photo shows four-channel model — prize is two-channel model

The PC inside Infinium oscilloscopes is based on an AMD K6 processor running at 200MHz and with 512KB of L2 cache, which allows waveforms to be updated at more than 1750 waveforms/second. It provides a waveform annotation feature (great for documentation), and along with standard I/O ports it even includes a 10Mb/s Ethernet port for LAN connectivity.

The HP 54810A Infinium Oscilloscope offers two vertical input channels, with a top sampling rate of 1GS/s and a maximum bandwidth of 500MHz, with 32K of memory depth per channel. It also offers an easy-to-drive 'analog like' front panel, plus a big and bright high-res LCD colour display screen. The controls are even colour coded to the channel traces, to minimise confusion. Setups can be easily saved and recalled from floppy disk, and the mouse-driven Windows GUI allow very intuitive 'drag and drop' operation for carrying out measurements.

In short, it's a truly superb instrument that would be a great asset to any home or professional lab — and it could be YOURS, if you're the lucky winner of our subscriptions draw!

Solid State Update



Keeping you informed on the latest developments in semiconductor technology

Single chip processes six modem channels

Analog Devices has announced a 16-bit digital signal processor (DSP) for Internet access infrastructure equipment. The new ADSP-21mod970 multiport Internet Gateway Processor promises to cut operating costs up to 50% for ISP, Enterprise Network, and other Internet access providers by eliminating the costly discrete systems needed to support multiple modem protocols.

Based on ADI's programmable DSP architecture, the new Internet Gateway Processor can process any protocol on any port. Each port can be configured on-demand for ISDN, V.90, K56Flex, V.34, Fax and Voice over IP (VoIP). Each of the six ports in this ultra-small, 1.45-square-inch chip can run a different protocol at the same time.

The ADSP-21mod970 multiport Intemet Gateway Processor is used in remote access concentrators, remote access servers, on-switch termination systems and voice-over-IP and fax-over-IP gateways. The chip's industry-leading power consumption of only 80mW per port reduces operating costs. The 21mod970 can also adopt new features and protocols via

software downloads to the on-chip 960KB SRAM. This extends product life and further reduces ISP total cost of ownership.

For more information circle **274** on the reader service card or contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940.

12-bit, 6MHz CCD/CIS processor for scanners

Burr-Brown's new VSP3000 is a complete mixed-signal processing integrated circuit (IC) which provides three-channel CCD (charge-coupled device) or CIS (contact image sensor) signal conditioning and 12-bit analog-to-digital (ADC) conversion for use in scanner applications including flatbed and PC scanners.

The VSP3000 is claimed ideal for these applications since it offers 12-bit resolution and provides the required 2MHz per channel necessary for three-channel video signal processing. Each channel contains sensor signal sampling, black level adjustment and a programmable gain amplifier to maintain optimum input signal levels. The ability to vary the gain of the input signal compensates for varying background light conditions. It also includes three Correlated Double Samplers (CDS) for extracting the pixel amplitude information from the noise, resulting in better image quality.

The VSP3000 features integrated triple-correlated double samplers, three-channel (6MHz) color mode, 0dB to +13dB analog programmable gain amplifier, internal voltage reference, +3V/+5V digital I/O compatibility, low power (400mW), and guaranteed no missing codes. It operates from 0 to +85°C with a single +5V supply.

For more information circle **271** on the reader service card or contact Kenelec, 23-25 Redland Drive, Mitcham 3132.

First 256Mbit Flash memory chips

Hitachi Australia has released what it claims as the industry's first 256Mbit Flash components, enabling the company and its customers to deliver the market's highest-density Compact-Flash and PC-ATA cards of up to 192MB and 640MB, respectively.

Using a proven 0.25um process, the components employ an enhanced Multi-Level Cell (MCL) technology that features the inherent benefits of high storage densities and lower cost-per-bit while providing enhancements in terms of power consumption and speed.

Two key market sectors for the 192MB and 640MB Flash cards include professional digital photography and industrial devices. As digital cameras enter the higher resolution 'megapixel' generations, the flash memory used to store the images must be able to offer the capacity required for the larger images as well as the data transfer rates necessary to write the image in a convenient amount of time. Hitachi's new 256Mb-based Flash cards provide a solution to this trend by offering superior densities with the fastest write/erase speeds: 3MB/s, or approximately 30 times faster than the industry's current mean performance of MLC-based cards at 100KB/s.

For more information circle **272** on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

Delta-Sigma ADC with 130dB range

Burr-Brown's new ADS1201 is a 130dB dynamic range delta-sigma modulator designed for use in high resolution measurement applications in industrial process control and portable instrumentation. The device achieves 24-bit analog-to-digital conversion, resulting in extremely precise measurements.

Full differential inputs and high resolution signal conversion make the ADS1201 suitable for industrial process control applications such as direct transducer interface for pressure, temperature, flow, weighing scales, motor control and force measurement systems. It is also suited for portable applications including thermometers, gas analysers and blood analysers.

The output of the ADS1201 provides a

serial data stream that is synchronous to the clock output. This serial data stream can be fed directly into a digital filter to complete the A/D converter. There are two advantages of this structure: application flexibility with the digital filter (the designer can tailor the characteristics of their digital filter without compromising the high bit rate conversion of the modulator) and low clock rate for both the clock and serial data stream.

For more information circle **275** on the reader service card or contact Kenelec, 23-25 Redland Drive, Mitcham 3132.

90° tri-colour LED assemblies

The **Optoelectronics Division of Bivar, Inc.** has introduced a T 1-3/4 (5mm) 90-degree tri-colour LED assembly that is claimed ideal for test and measurement, process control, go-no go indicators and computer UPS systems applications.

One of a series of new products from Bivar offering multicolour LED assemblies in a standard footprint, the new H178CBC 90° LED assembly comes in a single station housing using materials made of black nylon, per ASTM D-4066 PA111,UL rated 94V-0. It is wave solderable and built-in housing standoffs facilitate board washing and removal of fluxes and residue.

Initially white, the H178CBC offers a choice of three colour combinations: red/green/amber, yellow/green/amber, and red/yellow/amber. Colour selection is derived by switching the polarity of the signal, offering the use of one indicator in place of three. A daylight visible version is available including an ultra bright option(>1000mcd), making the H178CBC ideal for backlit applications. In addition, there is a choice of three circuit options: common anode, common cathode, and mixed circuitry.

Octal isolated digital coupler

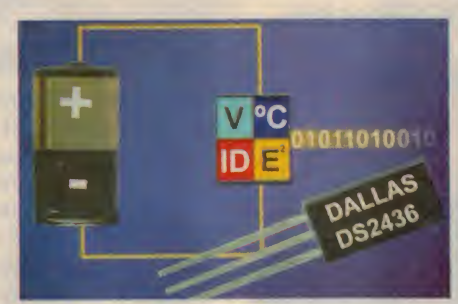
Burr-Brown's new ISO508 is an eight-channel isolated digital coupler offering low power and space savings for digital isolation in data acquisition systems. It provides signal isolation using Burr-Brown's innovative capacitive barrier technique, which has several claimed advantages over optical coupling techniques: lower power consumption, reduction in printed circuit board (PCB) area, and lower overall system cost. In a 16-channel isolated bus, the ISO508 offers a 70% savings in power consumption and an 80% savings in PCB area compared with optical isolation.

The ISO508 features low power consumption (<12mW per channel typical), 1500V RMS isolation, a transfer rate of up to two million 8-bit words/second without skew problems, asynchronous or synchronous operation, and double-buffered design for easy integration into bus-based systems.

For more information circle **273** on the reader service card or contact Kenelec, 23-25 Redland Drive, Mitcham 3132.

For more information circle **276** on the reader service card or contact M. Rutty & Co., 4 Beaumont Road, Mt Kuring-Gai 2080.

Battery ID and monitor chip



Dallas Semiconductor has announced a single chip that monitors battery parameters and stores pertinent data for battery identification and charge control. Integrating a 10-bit voltage A/D converter, temperature-sensing circuitry and nonvolatile memory, the DS2436 Battery Identification/Monitor Chip is designed for use as a data-acquisition system for batteries.

Battery packs equipped with a DS2436 carry their identification parameters and manufacturing data in 256 bits of nonvolatile memory. The host device can use this information to distinguish OEM batteries from clones, ensuring safe and efficient battery charging. The DS2436 is a chemistry- independent device: the host's firmware can use temperature and voltage data for charge termination and fuel gauging.

The DS2436 uses Dallas Semiconductor's proprietary 1-Wire technology to reduce the number of interconnects required for operation to three: data, power, and ground. With these minimal interconnects, the D82436 can be mounted directly in the battery pack, reducing tooling costs and board space consumption. The chip can share this data line with other 1-Wire components through the novel 64-bit ROM address assigned to each device, simplifying the design of gang chargers, general-purpose chargers for multiple battery packs, and battery clusters.

For more information circle **277** on the reader service card or contact Dallas Semiconductor, 4401 South Beltwood Parkway, Dallas Texas 75244-3292.

Power MOSFET and Schottky diode combo

Vishay Siliconix has announced what it claims are the industry's first combination power MOSFET and Schottky diode devices to offer adequate current handling for mainstream applications — with MOSFET on-resistance as low as 13.5 milliohms and diode forward current handling as high as 4A. These maximum specifications for Siliconix' new 'LITTLE FOOT Plus' products are claimed to represent a two-fold improvement over any other such combination devices on the market, broadening the scope of their target applications to include power conversion for cell phones, notebook PCs, and desktop CPUs.

The new devices will likewise provide a performance upgrade in established applications for this device type, such as battery disconnect in cell phones.

For more information circle **278** on the reader service card or contact distributor Braemac, 1/59-61 Burrows Road, Alexandria 2015. ❖

New Products

Portable recorder does harmonics analysis

The new **Hioki** model 8806-01 waveform recorder has an internal memory of 64KB and is also equipped with a PCMCIA card slot suitable for SRAM and ATA flash RAM. Data can be stored in binary, text or BMP format, and highly convenient post-measurement analysis can therefore be carried out on a notebook PC.

In addition to its eight logic channels and two analog channels, suitable for voltage and current recording, harmonic analysis to the 40th order is provided. A novel trending feature allows the observation of shifting harmonics patterns over analysis intervals as short as 22.5 seconds.

The Hioki 8806-01 has a footprint of only 182 x 257mm, and can be operated from AA dry cells, a rechargeable battery pack, or via an AC adaptor.

For more information circle **241** on the reader service card or contact Nilsen Technologies, 150 Oxford Street, Collingwood 3066.

Devices test lines for xDSL capability

Wandel & Goltermann has introduced a family of test kits for balanced subscriber lines. The test kits measure line parameters in only a few seconds, providing a fast indication of whether a line is suitable for xDSL, ISDN, PCM or conventional analog communications (POTS).

The test kit itself comprises two line measuring devices, which are connected to opposite ends of the line. The devices communicate automatically, enabling just one person to perform all of the measurements.

The device pair automatically determines all relevant parameters such as loss, near-end crosstalk, noise and loop impedance. Results are displayed numerically or in bargraph format with a PASS/FAIL indication based on the selected tolerance masks. The built-in reflectometer (TDR) indicates the distance to the three largest echo points (impedance mismatches) in the cable. This makes it easy to locate shorts, breaks, loading coils, bridged taps and so on.

For more information circle **245** on the reader service card or contact Wandel & Goltermann, 42 Clarendon Street, South Melbourne 3205.

250W DC-AC sinewave inverter

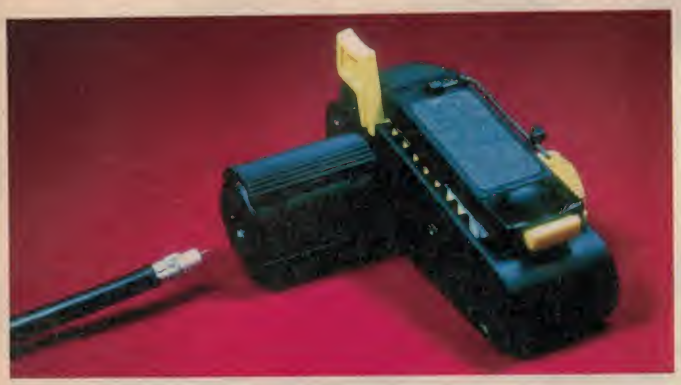
Vass Electronics has released a 250 watt DC to sinewave AC inverter for the OEM and consumer market, called the LS250. The consumer product has been designed for low cost and operates from 12V and 24V battery systems.

The LS250 complies with EMC standards and supplies 230V sinewave AC output to comply with the new international voltage standard. Features include 3kV isolation between primary input and secondary output, 600W overload capability for load equipment turn-on surges, an IEC three-pin mains output socket, primary supply DC circuit breaker protection, natural convection cooling (no fan) for improved reliability and installation ease, and an over temperature/low battery/severe overload shutdown protection circuit.

For the OEM market additional optional features include multiple input DC voltages (36V, 48V, and 110V), 120V AC output option, a LED output power bargraph, an alarm output module and output control input for remote site monitoring and control of the unit, low power idling mode for automatic/remote controlled mains equipment, an electronic earth-leakage circuit breaker (ELCB) for OEM cabinet applications, and cabinet mounting hardware suitable for mounting two inverters in 1RU of space.

For more information circle **242** on the reader service card or contact Vass Electronics, F1 42/44 Garden Boulevard, Dingley 3172.

5-in-1 coaxial cable stripper



Japanese cable and connector manufacturer **Canare Electric** has released their cost-effective TS100E coaxial cable stripper, which allows extremely rapid and simple cable preparation when terminating most common types of coaxial video cables.

Designed to compliment Canare's extensive range of precision 75Ω BNC, RCA and F-Type crimp connectors, the new TS100E ensures that cables are easily and precisely stopped to the correct dimensions. It features five factory pre-sets to suit all models of Canare coaxial cables. In addition, setup of the tool can be quickly adjusted to suit most cables with OD's ranging from 4mm to 11mm — including popular broadcast video formats such as RG59, RG6, RG11 and Mini Coax (0.173).

A knurled, spring-loaded hand grip automatically clamps down around the cable upon insertion to prevent twist and shift during the cutting operation. Three internal surgical steel blades perform precise, extremely clean, three-step cable cuts with a novel self-cleaning action. An additional laterally mounted blade side-slits the outer cable jacket for easy peeloff.

For more information circle **243** on the reader service card or contact Amber Technology, Unit B, 5 Skyline Place, Frenchs Forest 2086.

ASIC-based closed loop current transducer

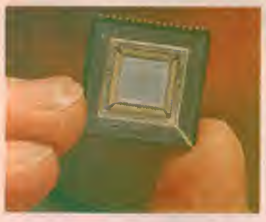
LEM has introduced the LTS 25-NP, a closed-loop current transducer capable of measuring DC, AC and impulse currents with full galvanic isolation. The transducer provides a multi-range configuration designed for nominal currents of 8A, 12A and 25A RMS.

Many connection options are available, allowing direct or differential current measurement. As a further advantage, the LTS 25-NP is capable of measuring more than three times the nominal current. This means currents up to 25.6A, 38.4A and 80A can be measured respectively for each range.

In addition to its miniature size (9.3 x 22.2 x 24mm), the device has an intrinsic accuracy of +/-0.2%, an excellent linearity of less than 0.025%, a bandwidth from DC to 200kHz and a very low temperature drift of only 50ppm/°C typical.

The LTS 25-NP measures both positive and negative currents but only requires a unipolar +5V power supply. In addition, a voltage output is provided by integrating a measuring resistor of 0.5% accuracy into the unit.

For more information circle **244** on the reader service card or contact Fastron Technologies, 25 Kingsley Close, Rowville 3178. ❖



Silicon Valley Newsletter

AMD launches single chip network solution

ADVANCED MICRO DEVICES has launched PCnet Home, a US$15 single-chip device that will let consumers use existing telephone wiring to build an integrated home network of computers, peripherals and communications systems, all without interfering with regular telephone services.

PCnet lets numerous PCs share access to a single Internet connection, data files, and resources such as printers by plugging the devices into a phone outlet. PCnet also includes a simple installation wizard. "AMD is providing a complete home networking solution that turns standard telephone wiring into a powerful digital communications channel, enabling home users to access data, peripherals, and the Internet from any phone outlet inside the home", said Atiq Raza, AMD's co-chief operating officer and chief technical officer.

Dataquest estimates more than 15 million homes in the United States currently have two or more PCs. This number is expected to grow to 26 million by 2003.

The PCnet-Home chip integrates an Ethernet controller based on AMD's PCnet-FAST Ethernet controller, a physical layer (PHY) device supporting the 802.3 standard for 10Base-T, and a HomePNA-compliant PHY device supporting 1Mb/s data transfer over standard telephone wiring. It supports automatic node detection, plug-and-play installation capabilities, an Internet activity log, customizable management utilities, and an Internet cache that can increase web browsing performance.

IBM announces Si-Ge breakthrough

IBM SAYS IT has perfected a new silicon-germanium chip processing technology that could boost chip performance by a factor of 50 to 100. The technique embeds germanium atoms in the silicon crystals that form the base of ICs. Infused with germanium, the silicon substrate becomes a better conductor of electricity. Currently, chips are made with a pure silicon substrate.

"Infusing a little germanium really speeds up the current", resulting in chips that can operate much faster, said IBM spokesman William O'Leary. Using a silicon-germanium substrate, a microprocessor that performs at 450MHz today could see a boost to around 50GHz. Most of the initial applications will be in chips for mobile communications, such as cellular telephones, pagers and personal digital assistants. IBM has an estimated 9-12 month lead over other chip makers in producing silicon-germanium based chips.

Adoption on a broader scale will depend on whether the new process can be made cost effective enough to be applied in high-volume applications. Alternatively, many chipmakers are working towards using a silicon dioxide process enhanced with gallium arsenide. But the latter has proven difficult to implement on wafers larger than four inches.

Iridium finally flies

MORE THAN A decade after it was first announced, the Iridium satellite-based global communications system became operational as 66 low-orbit satellites started to relay wireless communications signals from any point on the globe to any other location. With it, a mountain climber atop Mount Everest can tell his family and friends half a world away what that view looks like. "After 11 years of hard work, we are proud to announce that we are open for business. The potential uses of Iridium products are boundless", said Iridium LLC chief executive officer Edward Staiano.

The first official call on Iridium was made from the White House on Friday by Vice President Al Gore, who phoned Gilbert Grosvenor, great-grandson of telephone inventor Alexander Graham Bell and chairman of the National Geographic Society. Iridium carried Gore's voice directly to the nearest satellite, was relayed to the public telephone network in Phoenix, and sent on to Grosvenor's home.

Iridium telephones are bulkier and weigh more than regular cellular phones — the first models from Motorola and Kyocera cost around US$3000. Calls cost about $1.27 to $2 per minute for calls made within the United States and $2 to $7 per minute internationally. Voice quality is slightly below regular cellular services but far better than other satellite-based services.

Motorola founded Iridium in 1991 as a separate company in 1991, which has cost

Milpitas firm C-Cube Microsystems has announced DVxplore, claimed as the first single-chip CODEC for consumer MPEG-2 and digital video. It's expected to make possible low cost DVD-quality digital video recording and playback using home PCs, and also reduce the cost of DVD video players and recorders.

US$5 billion in start-up funding to date. Iridium was sold to a consortium of high-tech companies, with Motorola holding the largest stake at 20%. Others are Sprint, Raytheon, Lockheed Martin, and Pacific Electric Wire & Cable.

Iridium has some 270 distribution agreements with service providers and cellular partners in 125 countries, to serve more than 105 million wireless telephone subscribers.

SyQuest closes doors

SYQUEST TECHNOLOGY, a maker of high-capacity external data storage devices, announced it is giving up the struggle to survive. The Fremont company has suspended operations and prepared to file for Chapter 11 bankruptcy protection, throwing its remaining 900 employees out of work.

Last August SyQuest fired 950, or half its workforce, and ceased all manufacturing at its Fremont headquarters.

SyQuest has caved in under the heavy competitive pressures from Iomega, which has taken away much of SyQuest's share of the 100MB+ removeable disk drive market. The company has struggled with plummeting prices for its products, coupled with lacklustre PC demand this year.

In July, SyQuest hired CIBC Oppenheimer to help it explore acquisitions and financing. SyQuest has reported losses totalling more than US$200 million since 1995, as rival Iomega took over a large chunk of the high-density removeable disk market share.

Microsoft launches smart card OS

MICROSOFT HAS broadened the reach of its Windows operating system even further, by launching a tiny Windows OS spinoff for use in smart cards. Some 20 hardware vendors said they would develop systems to run under the software, which costs a fraction of a competing Java-based smart card OS.

The worldwide market for smart cards is expected to grow nearly fivefold to US$6.8 billion in 2002 from $1.4 billion in 1997, according to Dataquest. Microsoft believes the use of smart cards will increase even more, as more portable computer and communications devices become available in the coming years and consumers demand secure ways of accessing computer networks.

"We brought back our work on smart cards a year-and-a-half ago when we saw increasing demand for authentication of a user's identity to access a network, and an explosion in demand for online electronic commerce", said Craig Mundie, Microsoft's senior VP of consumer platforms.

France's Gemplus and Schlumberger Industries, two of the world's biggest smart-card makers, said they would support the new Microsoft software which costs around US$3 per card, compared to $20 for a Java card. The new Windows software needs a memory capacity of only 4.5 kilobytes, compared with 300KB for Windows CE.

US gets digital HDTV

ON SUNDAY November 1, almost a decade behind schedule, digital high-definition television (HDTV) signals hit the airwaves of the United States, where people spend an average of six hours a day watching TV. Some 22 stations in 10 major metropolitan areas started broadcasting in HDTV format, but very few viewers are yet able to enjoy the digital signals.

In fact, HDTV is not expected to become a force in the massive US television market until around 2005 or later, as consumers are expected to balk at the high cost of HDTV sets, which cost between US$7000 and $15,000. And even those who make the investment will find that very little HDTV programming will be available for quite some time.

US TV manufacturers have so far spent about US$100 million to prepare for the shift, and local TV stations are expected to spend $6.4 million each in the next three years to upgrade facilities and equipment. All TV stations must have adopted the HDTV format by 2006, when the US Federal Communications Commission has said it will halt broadcasts in the current analog format. "We are not sure how firm the 2006 timeline is", said Kevin Hause, senior analyst at International Data Corp. "TV manufacturers will be selling analog TVs for some time to come."

3Com ships high speed cable modem

COMMUNICATIONS TECHNOLOGY specialist 3Com has begun shipping a new generation of two-way cable TV modems that will let consumers send and receive Internet data over cable networks at speeds 20 times the current top rate of 56,000 bits per second. Unlike most current cable modems that offer high-speed only in the downloading direction, the 3Com devices also let users updata at high speed.

3Com's new Cable Modem CMX cable modems will be made and marketed by its US Robotics subsidiary. They will sell for around US$320. A complete kit, which includes the modem and a network interface card, or NIC, is US$360. (NICs link the coaxial cable to the PC). "We expect the pricing will head down as we ramp up volume", said Rick Edson, senior VP for new business initiatives at 3Com.

The consumer market for cable modems is expected to start growing rapidly in 2000, when more cable providers make the service available. Motorola, Samsung Electronics, Toshiba and Northern Telecom's Bay Networks unit are all expected to soon start selling similar cable modems. ❖

Faster, faster, faster!

IN THE MARKET for a new personal computer? 400 million instructions per second not fast enough for you? Just hold on a while longer, because a slew of new high-power chips are coming. Intel, National Semiconductor, IDT and Advanced Micro Devices have all laid out their plans for new generations of processors with speeds of up to 1GHz that will become available over the next 24 months, at the recent Microprocessor Forum in San Jose.

National Semiconductor/Cyrix: Cyrix will continue to focus on the market for sub-$1000 computers with four new classes of processor for everything from low-cost multimedia PCs to DVD players, set-top boxes, and even wearable PCs. National is planning to add two more processor families in 1999.

At the high end of the Cyrix line will be 'Jedi', a processor built around National's upcoming Cayenne processor technology. The Jedi is a modified Intel clone that fits into Socket7 motherboards. The Jedi chip will be made with a new 0.18um manufacturing process and feature speeds of 366MHz and 450MHz. Next is the Mxi line that will be launched in April, integrating a 3D graphics processor and running at 333 - 400MHz.

In 2000, National plans to boost performance of its chips with a new 'Jalapeno' chip architecure, which combined with Cayenne processing technology will produce chips that can operate at speeds of 600 - 800MHz. The Jalapeno design includes an 11-stage deep-pipeline, which allows Cyrix to boost clock speeds, and a completely new floating point unit, in addition to the 3D graphics features.

AMD: The first of AMD's new K7 chips will hit the market in mid 1999 with speeds of around 500MHz. By 2000, that could increase to 1GHz. The K7 will sport a secondary cache of between 512KB and 8MB.

Intel: Intel will not incorporate graphics into its Celeron chips, but will come out with Whitney, a companion chipset for low-cost systems with integrated 3D. Intel's future performance desktop chips will feature a new 'Katmai' instruction set, featuring a new series of floating point instructions that will enhance graphics and video by managing memory better.

Intel will launch new Pentium II chips in 1999 with names like Tanner and Coppermine, and new Xeon server chips called Willamette, Foster and McKinley.

Digital Audio Restoration Tools

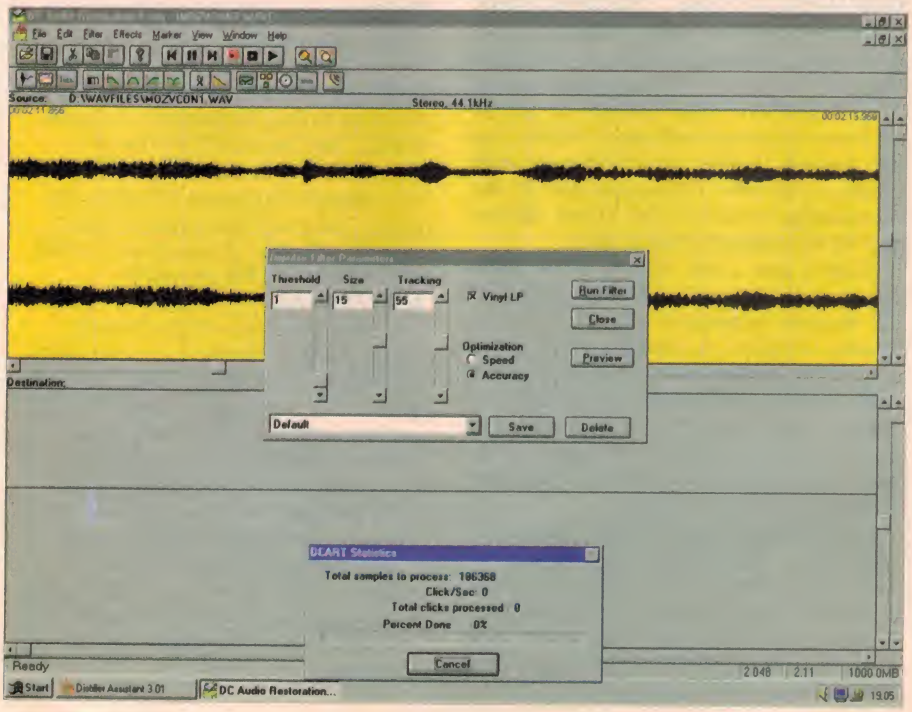
A growing application of digital multimedia technology is the use of dedicated signal processing software to 'restore' old analog audio recordings — remove surface noise, clicks and plops, filter out hum and rumble, correct speed errors and even apply equalisation to balance and extend tonal response. Here's a look at two of the most popular audio restoration packages for the Windows platform: Diamond Cut's Audio Restoration Tools, and DART Pro 32.

by Jim Rowe

BACK IN the March 1996 issue, I reviewed the first Windows-based digital audio restoration tool that had become available in Australia: Tracer Technologies' DART (standing for Digital Audio Restoration Technology). This was a 16-bit application, but I was very impressed with both its speed and capabilities when running under Windows 3.1 on a 90MHz Pentium.

Since then, Tracer has come out with a faster and more flexible 32-bit version of DART, called DART Pro 32. Another product has also entered the market, from a firm called Diamond Cut Productions. This one is called Diamond Cut Audio Restoration Tools, or DC-Art. Like the original DART it's essentially a 16-bit package, but a professional 32-bit version called DC-Art32 has already been released in the US and should be available here very shortly.

Over the last few months I've been able to try out both DC-Art and DART Pro 32 in cleaning up old recordings and transferring them to CDs, and in this article I'll try to pass on what I've found about them. I hope to have the opportunity to try out DC-Art32 soon too, and if so I'll cover it in a follow-up article.



Previewing the effect of the impulse noise filter in DC-Art. The filter parameters are set in the dialog box visible in the centre.

First of all, then, let's look at:

Diamond Cut ART

Diamond Cut Productions is based in Rockaway Township, New Jersey, and was founded by engineers Craig Maier and Rick Carlson in 1992. During the late 1980s the two became heavily involved in restoring early recordings for the Edison National Historic Site, and later for the Smithsonian Institution. As part of this work they developed their own digital restoration software, which was released in the USA as DC-Art in mid 1996. Since then it's undergone a series of enhancements and revisions, with the latest 16-bit version being designated V2.0. It comes on a couple of 3.5" floppies.

Although DC-Art will run on a 33MHz 486DX with 8MB of RAM and Windows 3.1, Diamond Cut recommends using a 486DX2 or Pentium running at 66MHz or better. If you run it on a 133MHz or faster Pentium, it'll perform most of the filtering functions in the same time as the audio file's playing time, or less. It's compatible with Windows 3.1X, Windows 95 and Windows NT 3.51 or later. I've been using it on my 266MHz Pentium II under Win NT4, with 64MB of RAM, and it runs very snappily.

As you'd expect it provides an extensive suite of tools for 'cleaning up' old recordings from almost any source — whether it be early acoustic cylinders or discs, electrically recorded 78 and 33.3rpm pre-microgroove discs, radio transcriptions, old tape recordings or movie soundtracks. It also has applications in specialised areas like forensic

sound analysis and improving the intelligibility of security recordings.

In addition to a lot of basic audio file editing functions like recording and playback, cut/copy/paste and so on, its functions include:

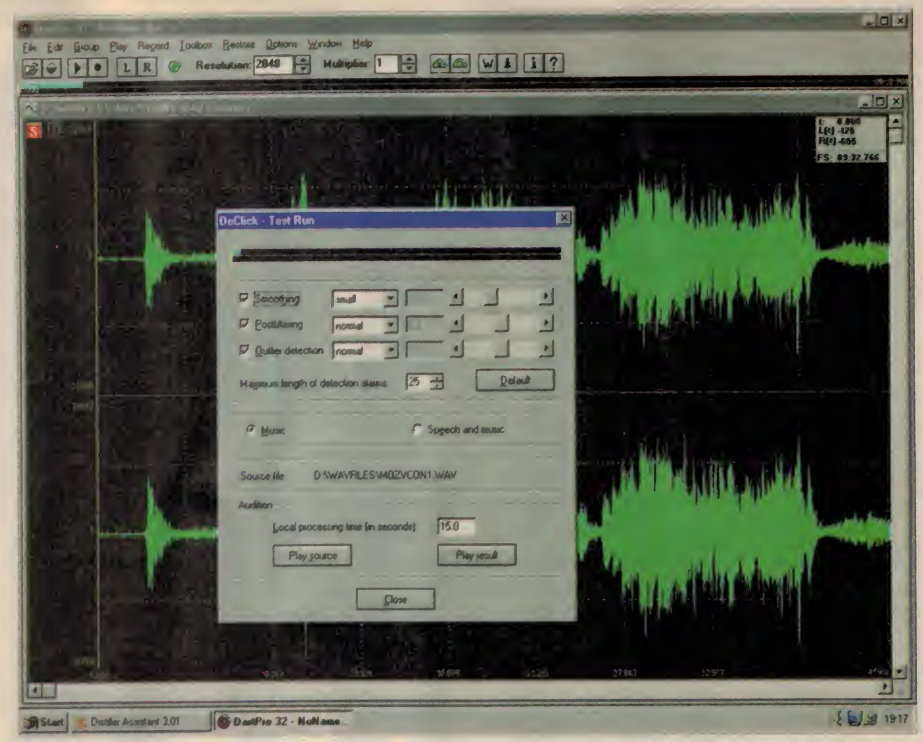
- An impulse noise filter, for removing ticks, clicks and pops;
- A continuous noise (hiss) and crackle filter, for removing surface noise;
- A dynamic or 'single-ended' noise filter, to remove ground-noise hiss and tape noise;
- Lowpass, bandpass and highpass filters with first, second and third-order slopes, a harmonic reject filter, and a tuneable notch filter for hum and feedback removal;
- A 10-band graphic equaliser, for achieving a better tonal balance;
- Fade out, fade in and gain change functions, with either a linear or logarithmic envelope;
- Speed correction, for adjusting the playback speed of off-speed recordings (or sections of recordings), or those transcribed from originals at lower speed (i.e., 78rpm discs played at 45rpm, or 80rpm discs played at 78rpm);
- A high quality, flexible digital reverb algorithm, for adding room 'presence' and stereo simulation;
- Live previewing of many of the filtering functions, to allow adjustment of control parameters; and
- A spectrum analyser function to allow easier identification of problem signal components.

Many of the restoration tools can be used either 'manually', to remove a selected noise 'event' in the recording (say a particularly nasty isolated click), or in 'file mode' to operate automatically on the complete recording or a section thereof. Either way, the processing is non-destructive and doesn't irreversibly change your original WAV file. In the case of single-event filtering you can always 'Undo' the operation if it doesn't work out the way you intend, while running a filter on the complete file or a significant part of it produces a separate 'destination' file and always leaves the source file untouched.

Another nice touch is that all of the algorithms used in DC-Art 2.0 use double-precision floating point maths, for minimum audio degradation.

In my own trials of DC-Art so far, I've found it not only powerful and effective as an audio cleanup tool, but also very convenient to drive. I especially like its system of zooming in for a closer look at a part of your file: you simply drag a highlight box over the section of interest on the screen representation, and then click on the 'Zoom In' button. Returning to the original view is even easier; you click on the 'Zoom Out' button.

Another feature I found myself using a lot is its 'Paste Interpolate' function, for removing individual click events. Here you just zoom in to find the event concerned, highlight it and hit the 'I' key on the keyboard. This activates a high-order modelling algorithm, which replaces the click with a 'best guess' recreation of the waveform. In almost every case it seems to be spot on, too...



Testing the effect of DART Pro 32's DeClick filter. Again the filter parameters can be set in the dialog box, and the result easily compared with the original.

Of course if your recording has a lot of smaller clicks and ticks, this kind of manual retouching is hardly feasible. That's when you have to use DC-Art's main 'file mode' impulse noise filter, and this can be a bit tricky in terms of finding the right settings for the detection parameters. On the whole, though, I found DC-Art very friendly in this area as well. Thanks to the preview mode, and also the tips given in their manual, it usually doesn't take too long to find acceptable settings.

Overall, then, I found Diamond Cut's Audio Restoration Tools a very effective package, and very easy to use. It seems to me very good value for money too, at the quoted price of $195.00.

DART Pro 32

As mentioned earlier, this is the enhanced and upgraded 32-bit version of the original DART (which later became DART Pro) that I reviewed in 1996. It seems to be produced by US firm Dartech LLC of Minneapolis, but like DC-Art it's distributed by Tracer Technologies of York, Pennsylvania. Tracer has been specialising in digital restoration of audio for quite a while, and has built up a lot of expertise in this area.

DART Pro 32 is now up to version 1.09, and runs on any PC with a 486DX or better running Windows 95/98 or Windows NT. It comes on a CD-ROM, and in the case of the review sample the CD actually had V1.01, which turned out to have video refresh problems on my Pentium II/266MHz machine running NT4. However these problems went when I downloaded the V1.09 upgrade from Tracer's web site, and installed it.

Like the original DART, and indeed like DC-Art, DART Pro 32 is essentially a powerful audio file editor with additional filters and other tools for restoration. So again you get all of the basic audio file editing functions — record, play, cut/copy/paste, rescale etc, plus a powerful array of restoration functions:

- A DeClick filter, to remove pops and clicks;
- A DeNoise filter, to remove continuous background and surface noise, motor rumble etc;
- A DeHiss filter, to remove tape noise;
- A Reverse function, which allows you to reverse the sample order of an entire file or segment (often restoration filters seem to work better on reversed files);
- A Retouch function, for 'filling in' sound gaps due to tape dropouts, etc;
- A Duplicate function, to fill in and edit larger sound gaps;
- A NoisePrint function, to save an image of a noise pattern to make filtering easier;
- Lowpass, Highpass, Bandpass, Bandstop and Notch filters, with selectable linear phase option;
- A 10-band (for 44.1kHz sampling) Graphic Equaliser, again with selectable linear phase;
- A Filter Builder facility, for creating your own custom 'filtering macros' which can be saved, reloaded and run automatically when needed;
- Resampling and Adjust Sample Rate functions, which allow conversion of files to different sample rates (both up and down),

and also speed conversion — allowing such things as recording a 78rpm disc at 33.3rpm, and then converting it to the correct speed; and

- A Spectrum Analysis function, to allow you to spot the problem signal components and areas where equalisation may be needed. You have a choice of either 2D or 3D spectral views, too.

Again virtually all of the filters have a Test mode, for trying different parameter settings before you run them, and/or the ability to compare the source and destination files after they've run. And as with the original 16-bit version, DART Pro 32 comes with its own sound file management system (DART Wave Manager), which links original source files with the destination files derived from them. This should appeal particularly to professional users.

Not surprisingly, DART Pro 32 is considerably faster in its processing than the 16-bit version. This means it's quite zippy, even when performing complex multi-step processing on large 44.1kHz stereo files.

Needless to say DART Pro 32 does have its own way of doing things like zooming in on waveform details and setting filter parameters. These are generally all quite friendly, once you get used to them, although I did find it a little harder to find optimum settings for the DeClick filter, for example compared with DC-Art. In this case DeClick is a two-step process, first performing smoothing and click detection/removal with an 'Outlier' detector, and then performing postfiltering. There are four parameters to adjust in all, when you're trying to optimise operation for a particular recording, and there can be a fair bit of trial and error.

On the other hand, DART Pro 32's ability to swing files around for reverse processing is especially nice, and its file management is excellent. It can also record your files directly to a CDR disc in CD-A format, if you wish.

On the whole, then, it's a very powerful and professional package, and should be a good choice for those who want an 'industrial strength' audio restoration package. It's somewhat more expensive than DC-Art though, with an RRP of $695.

By the way, both DC-Art and DART Pro 32 are distributed in Australia by Melbourne firm Multimedia 'n Music. You can get more information about them (and the new DC-Art 32) on their website, at **www.multimedia-music.com.au**, and even download demo versions of the programs if you wish (as well as upgrades). If you want more information on digital audio restoration, you can find that too, at **www.enhancedaudio.com**, a site run by Tracer Technologies. ❖

Diamond Cut ART

A powerful but easy to use 16-bit audio file restoration package.
Good points: *Very intuitive operation, helpful regarding filtering parameters. Nice 'Paste Interpolate' function for removing individual click events. Attractively priced.*
Bad points: *Doesn't facilitate easy file reversal for reverse processing.*
RRP: *$195*
Available: *Multimedia 'n Music, 145 Como Parade East, Parkdale Vic 3195. Phone (03) 9587 6910, fax (03) 9587 6912.*

DART Pro 32

An 'industrial strength' 32-bit audio file restoration package.
Good points: *Fast, with excellent file management; provides file reversal for reverse processing; can record direct to audio CD, if you have a CD writer.*
Bad points: *So powerful that operation can be a bit more tricky; fairly expensive.*
RRP: *$695*
Available: *Multimedia 'n Music, 145 Como Parade East, Parkdale Vic 3195. Phone (03) 9587 6910, fax (03) 9587 6912.*

Terratec's Base 1 PC soundcard

If you're serious about the audio processing capabilities of your PC, chances are that your current soundcard is the weak link in the chain. Upgrading to a high-performance card such as the Terratec's Base 1 can bring full CD-quality audio to your PC.

by Rob Evans

ONCE CONSIDERED either a gimmick or an unnecessary luxury, a soundcard has now become an essential part of a wide range of PC applications. Leaving aside the often thorny issue of PC games, a soundcard's overall audio performance will directly effect the quality of your audio recordings, the results from software-based test instruments and analysers, plus the outcome from a host of other audio applications such as speech recognition and music composition.

Unfortunately though, the low-cost 'generic' sound card installed in most off-the-shelf PCs will usually deliver a fairly mundane audio performance, which really does compromise these applications. The cards are quite adequate for reproducing the crashes and screams from basic PC games or Windows' own bings and bongs, but generally fall short in the area of audio bandwidth, noise and distortion — that is, in the *analog* sections of the card.

So if you're interested in the more audio-intensive applications, or just want to get the best possible sound from the new breed of sophisticated PC games, it's well worth considering one of the 'up-market' soundcards that claim to offer a superior audio performance. Currently these appear to have splintered into two groups: high-performance ISA-slot cards aimed at home recording, and fast PCI-slot cards directed at the games market, which comply to the latest DirectSound3D and A3D standards — or whatever the enhanced sound system is this week...

The Terratec Base 1 soundcard featured here seems to be squarely aimed at this first group, and as a result offers a high-quality analog front-end, 16-bit sampling at up to 55.2kHz, full duplex operation, plus a standard connector for add-on wavetable modules — aimed at musicians wanting the benefits of sampled wavetable synthesis.

Using a conventional ISA slot, the Base 1 also offers standard features such as full Soundblaster compatibility, a OPL3-compatible FM synthesiser, a games port with MIDI connections, plus the usual MPU-401 MIDI interface. The card itself is based on an Analog Devices 'Soundport' LSI chip plus just three 8-pin DIP devices. Unusually it's also equipped with an on-board connector for a radio module, such as Terratec's own 'Active Radio' VHF Stereo Tuner.

Oils ain't oils, as they say; and soundcards ain't soundcards. Terratec's Base 1 system beats the pants off standard soundcards when it comes to sheer audio performance - it comes with a huge amount of music-related software, too.

The Base 1 package has an RRP of $159, and comes with a quite thorough manual (which suffers somewhat from clumsy German to English translation) plus a deluge of software on the included CD. This has drivers for all the common operating systems including straight DOS through to Windows NT4, a number of utilities, plus several music-related (usable) demo programs from the likes of Steinberg. As if making the point that the card is also fine for PC games, the CD also has a demo version of Formula 1 Grand Prix 2 from Microprose — quite good fun, if you like that sort of thing...

Installation(s)

There's something about soundcards that injects a degree of fear and loathing when you're about to tackle the installation process. Perhaps it's the fact that they have the unique demands of several port addresses, DMA channels and IRQ lines, which leads to a rich environment for things to go wrong. With Plug and Play compatible cards such as the Base 1 though, this should be automatically taken care of by the PC, and need little human intervention.

Unfortunately though, the Base 1 didn't install smoothly on any of the PCs we tried — which included three Windows 95 machines of various stature, plus one loaded with Windows NT4. We gave up the fight with the latter machine, but perseverance paid off on the Win95-based machines and we were eventually rewarded with a stable system offering all of the card's features.

In retrospect it seems that the nub of the problem is in the installation program itself, which has the unfortunate habit of assuming *absolute* directory paths to driver files. Thanks to its added quirk of making variable (and usually wrong) assumptions as to the letter assigned to the CD drive, plus looking for invalid paths on the Win95 CD, the installation program seemed to consistently make a mess of things.

The moral here is to first follow the manual's detailed instructions on removing all evidence of a previous soundcard, then carefully go through the installation process while manually locating each driver file via the install program's Browse facility. With this method the card can be installed without trauma and repeated system lockups.

(Continued on page 96)

Computer

News & New Products

Notebook PC is multimedia capable

The new **Acer** Extensa 500 is a highly versatile notebook PC offering what Acer claims is outstanding multimedia capabilities. It's designed particularly for professional and business users.

Powered by an Intel Pentium 233/266MHz processor with MMX technology and 512KB L2 cache, the Extensa 500 incorporates a large capacity IDE hard disk drive, an internal 1.44MB floppy disk drive, a 20x maximum speed CD-ROM drive and an integrated 56kb/s fax/modem as standard. It also comes with 32MB SDRAM system memory, expandable to 128MB.

Advanced multimedia capabilities include the PlayNow music function, Hi-Fi CrystalSound speakers for 3D stereo sound, a 128-bit NeoMagic graphics accelerator (with 2MB of Video RAM) and a bright 12.1" HPA (high performance addressing) display which provides a wide viewing angle, sharp resolution (800 x 600 pixels) and 16.7 million colours. The

CrystalSound speakers are at the front of the unit in acoustically tuned chambers, and are driven by a Yamaha YMF715E audio chip with built-in FM synthesiser and a 3D enhanced controller.

The Acer Extensa 500 series with Pentium 233MHz processor is priced from $2799 (RRP). For more information circle **161** on the reader service card or contact Acer Computer Australia, Tower A Level 3, 112-118 Talavera Road, North Ryde 2113.

Colour printer delivers 1440dpi, fast

Canon's new BJC-5000 uses a dual cartridge system for increased print speed and exceptional colour quality at 1440dpi. The new printer employs PhotoRealism and Drop Modulation technology, prints at up to A3 size and uses enhanced black ink cartridges for high-quality monochrome printing at laser-like speeds.

The BJC-5000 features what Canon describes as breakthrough technology, with the new dual cartridge system. Two printheads sit side-by-side, minimising cartridge travel and thereby increasing printing speed. By using two identical black or colour catridges the BJC-5000 can print in split page mode so the cartridges work together to pass across only half the page each, allowing speeds of up to 7.5ppm in monochrome printing and 2.85ppm in colour.

The BJC-5000 has a built-in sheet feeder for up to 130 sheets, and the ability to print A4 full bleed and A3. It has an RRP of $599 and is available from Canon dealers and selected retail stores.

For more information circle **160** on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.

17.2GB hard disk drives from Maxtor

Maxtor has announced its 17.2 gigabyte DiamondMax 4320 series of hard-disk drives, claimed as one of the first 4.3GB-per-platter desktop drives shipping in volume from any manufacturer. In addition to capacities up to 17.2GB, the drives offer UltraDMA compatibility and an average seek time of 9.0ms (milliseconds).

The DiamondMax 4320 is Maxtor's seventh-generation drive series with magneto-resistive (MR) heads. The drives hold 4,320 megabytes per platter. Other features include a digital signal processor (DSP)-based electronics architecture, partial response maximum likelihood (PRML) read channel technology, and Maxtor's exclusive Formula4 four-disk head disk assembly (HDA).

The DiamondMax 4320 also premiers the new MaxSafe system for automatically detecting, isolating and repairing hard drive problems.

For more information circle **162** on the reader service card or conatct Maxtor's distributors Servex Australia and Edge Technology, on (02) 9870 1999 and (02) 9353 9200 respectively.

21" monitors for graphics professionals

Hitachi Australia has announced a new range of 21" graphics monitors. The CM81X family features high resolution and refresh, a new high accuracy tube and gun, and advanced digital controls — making them very suitable for use by professional users of desktop publishing, imaging, CAD and engineering applications.

Top of the range is the Hitachi CM813, with an industry leading 1856 x 1392 resolution at 71Hz refresh rate. The standard VESA resolution of 1600 x 1200 is supported at 90Hz, while the CM811 supports the same resolution at 75Hz.

With dimensions of 488 x 482 x 470mm and a weight of 27.5kg, the new monitors are suitable for situations where desk space is freely available. The series also offers a viewing area some 22% larger than the company's award-winning 19" CM75X range. Both 21" models use a newly developed, high performance yoke and deflection system, providing the maximum in brightness, contrast and quality while minimising picture distortion.

Set up and adjustment is simplified by the incorporation of Hitachi's EasyMenu advanced digital on-screen control, which allows access to functions from the front buttons. Up to 26 sets of screen geometry settings such as position, size and rotation, can be stored and recalled at will. Full digital colour control function is also provided, with the ability to store and recall various colour parameters including temperature and balance, a must for the graphic artist.

To be considered a true professional's choice, Hitachi has incorporated VESA DDC plug and play standards into the

CM81X series. A user simply allows the Windows operating system and graphics card to detect and set up all necessary adjustments on the monitor, and an advanced power saving system conforming to EPA guidelines ensures low cost of ownership.

The CM-811 has an RRP of $3399 inc tax and the CM-813 and RRP of $4499 inc tax. For more information circle **163** on the reader service card or contact Hitachi Australia, 13-15 Lyonpark Road, North Ryde 2113.

Fibre optic modem for CCTV

Optical Systems Design has released its OSD420 fibre optic transmission system, which is designed to handle almost all requirements typical of CCTV systems. One variant supports video plus full duplex audio and data, while a lower cost version supports video and reverse audio and data.

Units are available to operate over either single-mode or multimode fibre. They are normally supplied to operate over two optical fibres (one in each direction) but are optionally available for operation over just one fibre. The video and audio have exceptionally wide bandwidths and low noise, making the unit very suitable for the most demanding CCTV and distance learning applications.

Data transmission covers all standard interfaces such as Manchester, Biphase or Relay connections. The unit is available in either standalone or plug-in card format.

For more information circle **166** on the reader service card or contact Optical Systems Design, PO Box 891, Mona Vale 2103.

Stepper motor control for CompactPCI and PXI

National Instruments has announced a new series of modules that deliver accurate, high-performance motion control for stepper motor applications in CompactPCI and PXI systems. The PXI-7314 open loop controller and PXI-7324 closed loop controller are fully compatible with the CompactPCI and PXI specifications.

The new intelligent motion modules provide the functionality and power needed for integrated motion system solutions in industrial automation and measurement applications. PXI offers instrumentation extensions to standard CompactPCI systems. PXI systems are compatible with National Instruments LabVIEW, BridgeVIEW, LabWindows/CVI, and C/C++.

The modules can control up to four stepper motors with fully programmable pulse and direction or clockwise/counter-clockwise output signals, amplifier inhibit/enable signals and forward, reverse or home limit inputs per axis. Stepper control includes velocity and acceleration profiling with S-Curve acceleration boost for enhanced motion trajectory performance. Step output pulse rates to 1MHz easily handle all Full, Half and Micro-Step applications.

The PXI-7324 closed loop version adds quadrature encoder feedback inputs per axis, allowing motion tracking, positioning breakpoints, following error control and in-position verification.

For more information circle **164** on the reader service card or contact National Instruments Australia, PO Box 466, Ringwood 3134.

Controller board uses Tiny Tiger CPU

Victorian firm **JED Microprocessors** has developed a high performance controller board for scientific and industrial applications, based on the powerful Tiny Tiger microprocessor modules from German maker Wilke Technology.

The BASIC Tiger and Tiny Tiger microprocessor modules present an easy way for builders of embedded control systems to build, program and put small systems into production. The modules are available in a range of memory capacities: BASIC Tigers are available with up to 4MB of Flash and 2MB of RAM inside, while Tiny Tigers can have 128KB/32KB, 128KB/128KB or 512KB/512KB respectively.

JED's TIG505 board uses the smaller Tiny Tiger, placing it on a compact (110 x 150mm) board to make using it easy. The board has a Xilinx XC5204 gate array and input protection or FET drivers between the Tiger and all I/O screw tenninals, isolating the Tiger from the outside world for ESD and EMC purposes. Tiger pins are bypassed to a grounded PCB plane, and all supply rails are EMC filtered.

The Xilinx PGA can be reprogrammed by users downloading a data file from the Flash memory, so users can re-wire the system between the pins and the Tiger — adding their own counters, pulse generators, shift-register filters, etc. Users have 20 logic input terminals, 24 outputs with open-drain FETs and four 10-bit analog inputs. There are also two serial ports for communication. The board can be used as a conventional 'single board computer' (SBC), can have a four-line by 20 character LCD added on top, or can mount behind a panel as a smart controller.

A powerful development system runs under Windows, edits, downloads to Flash and remotely debugs target at source level.

The JED board is the first made in Australia to support the Tiger, and is the first of a family to allow 'screwdriver' building of systems, with gate-array reprogramability.

For more information circle **165** on the reader service card or contact JED Microprocessors, 173 Boronia Road, Boronia 3155.

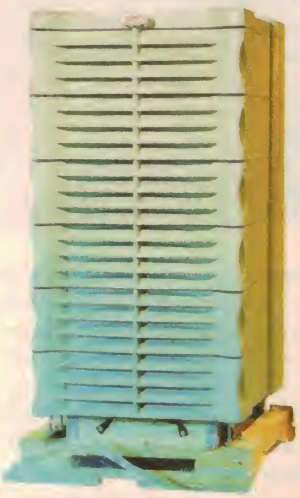
Power supply array offers high security

American Power Conversion (APC) has released the Symmetra Power Array, an advanced power protection solution that eliminates traditional power supply 'weak links' in IT systems. Symmetra brings RAID-type architecture to the power supply market, improving the reliability of power supplied to central servers and business critical applications.

Traditionally, power problems have been the weak link in the fight to maintain high system availability. Symmetra solves this prob-

lem by combining novel power-sharing technology, extensive redundancy and dynamic load-sharing capabilities. The technology integrates and manages a range of modular components, ensuring failure in one does not affect the power flowing to attached IT systems.

Symmetra's power array technology includes power modules (4kVA each), battery modules, a Main Intelligence Module (MIM) and Redundant Intelligence Module (RIM). These modules back each other up and can be hot-swapped while the load is up, running, and fully protected.



For more information circle **167** on the reader service card or contact American Power Conversion on 1800 652 725.

Low cost PCI frame grabber

MuTech Corporation of the USA have announced the M-Vision 500, a low cost, high quality colour/monochrome PCI frame grabber capable of digitising video and transferring the digital data to system memory or the VGA display in real time.

The M-Vision 500 captures composite NTSC/PAL, Y/C or RS-170/CCIR video as well as non-interlaced video from progressive scan cameras. A trigger input allows detection of an event and generates an interrupt to grab the video. Video is captured at 30 frames/second (NTSC) or 25f/s (PAL).

The card is PCI 2.1 compliant and transfers data at 132MB/s over the PCI bus either to system memory or directly to the VGA card. Either way, real time display of the video is shown on the VGA monitor. It supports scatter/gather under Windows, so that addresses can be generated and stored and one interrupt per field/frame is serviced. It also has a VESA standard Video Interface Port (VIP) that can connect to a compatible VGA card via a ribbon cable. Video is then passed over the VIP and displayed on the VGA without burdening either the processor or the PCI bus.

All boards are supplied with a software utility running under DOS, Windows 3.x, Windows 95/98 and Windows NT, allowing the user to grab, display, freeze, save (as tif, tga or bmp), or recall images. TWAIN and MCI drivers are provided for Windows 95/98 and Windows NT.

For more information circle **169** on the reader service card or contact The Dindima Group, 10 Argent Place, Ringwood 3134.

Fast access 3.5GB Flash drive

M-Systems' FFD SCSI Flash Disk breaks its own previously held capacity record of 1792 megabytes with the new 3.584GB drive. The 3.5" drop-in replacement for hard disk drives meets new demands from military, telecom and energy industries. M-Systems claims it's the first in the market to develop and supply this capacity.

The new FFD-350 SCSI Flash Disk, claimed as the fastest flash disk in the world, is a 3.5" flash disk based on the SCSI II interface. Its 3.5" form factor (25mm height) is identical to common electromechanical disk drives, allowing it to easily replace standard hard disks and provide a much more reliable and rugged data storage solution.

The drive's 3.4 million hour MTBF is claimed to provide the highest media reliability available today. The FFD provides performance of less than 0.1ms access time, burst read and write rates of 9.7MB per second (MB/s), a sustained read rate of 2.8MB/s and sustained write rate of 2.0MB/s.

For more information circle **168** on the reader service card or contact Priority Electronics, 189 Bay Road, Sandringham 3191. ❖

Terratec's Base 1

(Continued from page 93)

Performance

With the card finally installed and operating correctly, we were indeed rewarded with the promised performance of the Base 1 soundcard. In the subjective sense, the card's output was noise-free — a distinct problem with some of the older SoundBlaster cards — and delivered very clean results from a number of acoustically-demanding WAV files. Recording through the line-in sockets and then playing back that stored file produced similarly clear signals, with no hint of sampling artifacts or harmonic distortion.

The objective tests were mostly handled by the WAV file editing and analysing package CoolEdit, which through a large number of 'spot' frequency tests gave a clear picture of the card's recording ability. This aspect is particularly important for applications where the sampled sound will be permanently stored in a digital format, then played back via some other means, as is the case when creating your own CDs or storing sampled sounds for music applications.

In all of our tests the Base 1 delivered a performance that's way beyond generic or older-style soundcards, and closer to that of audio CDs. Its frequency response was measured at 10Hz to 20kHz within 2dB, the noise floor at around -95dB and its harmonic distortion at less than 0.05%. This is excellent performance indeed when you compare these figures to that of standard low-cost card, which would typically have a response of 100Hz to 10kHz +/-3dB, a noise floor at around 70dB (or worse) and a distortion figure in the region of 0.1%.

These results show that Terratec certainly haven't compromised on the Base 1 card's analog front-end or 'brick-wall' anti-aliasing filter, and goes a long way to justify its extra cost over a less up-market card. It makes Base 1 an ideal soundcard for those recording CDs from an analog source, and for musicians recording sampled sounds for later composition. Of course, it will suit just about any application where the record/playback quality of the card is critical, including audio analysers, loudspeaker testing systems, and just about any soundcard-based test instrument.

By the way, our review version of the Base 1 card was supplied as part of a bundled package formed around the 'Sound Engine' music creation and editing software compilation. This includes full versions of a number of packages, including Steinberg's Cubasis Lite, and also offers some 600 WAV-file samples. The 'Sound Engine plus Base 1' bundle is priced at $199, which means you effectively pay only $40 for the Sound Engine package.

The review products were supplied by Terratec's local distributor, Moore Music. To find out more about the Terratec product range plus a wide range of other music creation software and hardware, check out their web page at **http://www.mooremusic.com.au.** ❖

Terratec Base 1 soundcard

A high-performance 'up-market' soundcard featuring sampling rates of up to 55.2kHz, a low-noise wide bandwidth front-end, full duplex operation and provision for wavetable 'daughterboard' add-ons. Supplied with drivers for most PC platforms plus a host of bundled software.

Good points: *Excellent recording/playback performance. Fully Soundblaster-compatible. Thorough user manual.*

Bad points: *Troublesome installation program.*

RRP: *$159, or $199 for the 'Sound Engine Plus Base 1' bundled package.*

Available: *Moore Music, 219 Napier St, Fitzroy 3065. Call (03) 9419 0344, or fax (03) 9417 6697.*

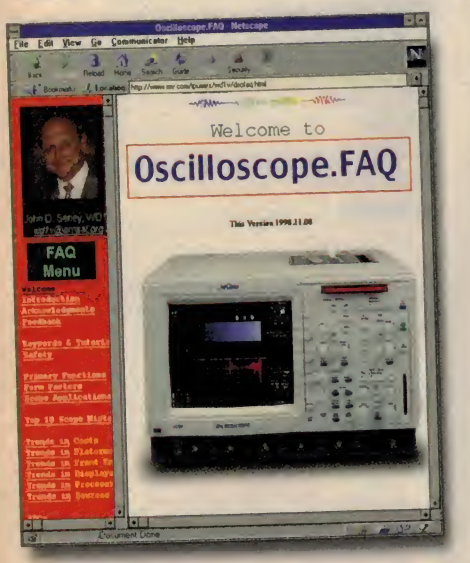
Web watch

by Graham Cattley

THE SMILING FACE of John D. Seney greets you as you open his Oscilloscope.FAQ page, as does the cheery face of a LeCroy LC584 oscilloscope.

The page (at **http://www.mv.com/ipusers/wd1v/dsofaq.html**) covers the ins and outs of DSOs, so if you are lucky enough to own a digital scope, this is a good site to explore.

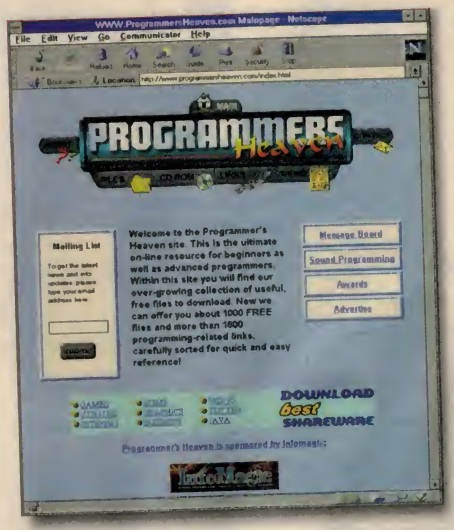
Separate pages covering safety, ADCs, bandwidth, triggering, measurements and DSP tools (to name a few) make this a fairly comprehensive site. John then goes on to list the sort of things to look for when buying a DSO, with notes on comparing models, what to look for in scope demonstrations, and purchasing a scope.



His links page includes a number of good scope-related sites, including a quite good tutorial in DSO fundamentals from LeCroy.

I DON'T USUALLY list programming sites in Webwatch, in an effort to keep this column orientated more towards electronics, but after seeing Programmer's Heaven at **http://www.programmersheaven.com/index.html**, I changed my mind.

The site was recommended to me by Alister Huf, and I'm very grateful to him as it contains many useful files (and a lot of source) for everything from assembly coding through to Delphi components. There really is tons of stuff here — demo programming,



graphics, sound, utilities and even Java and CGI code too.

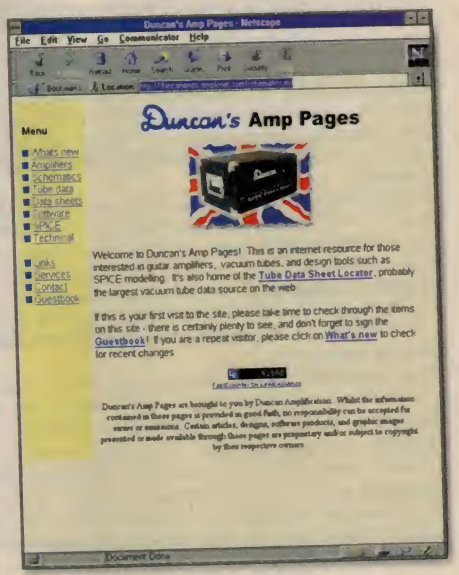
Even if you only use QBASIC you'll find *something* of interest here, and most of the files and examples a pretty small, so they don't take long to download. Hmmm, let's see now, I was after a signed 16-bit multiply routine in assembly...

AMONG OTHER THINGS, George Katz of GKDesign designs robots, and quite a few of them too. His site at **http://www.geocities.com/siliconvalley/Lakes/7156** is quite interesting, with a robotics page covering the construction of several robots, and a promise of regular updates as various models are developed.

If nothing else though, you must read 'CURI *vs* Cat', a true story about one of his robots outwitting a cat. (Although I'm of the mind that the cat won in the end.) You'll find it on the Publications page, along with references to several articles George has had published in EA.

I CAN THANK *EA* reader Damian Corbett for suggesting that I look at Duncan's Amp Pages (**http://duncanamps.simplenet.com**), whose site can perhaps be summed up by their opening statement: 'This is an internet resource for those interested in guitar amplifiers, vacuum tubes, and design tools such as SPICE modeling. It's also home of the Tube Data Sheet Locator, probably the largest vacuum tube data source on the web.'

Whic[illegible] great, except that they don't mentio[illegible] they also maintain a huge database o[illegible]e amplifier schematics available on th[illegible]o as well. Their Schematics page contains a listing of hundreds of amps, from Marant[illegible], Leak and Quad, through to Fender, Vox and Marshall. The diagrams themselves are situated on different sites around the world, but the Duncan's Amp site integrates them all together very successfully. A good resource — check it out.



CRAIG HART maintains an interesting site for anyone involved with repairing PCs. Craig is a very competent chief technician at a PC repair company, and has written a number of diagnostic programs that go a lot deeper than most commercial packages.

He has programs to check out APM support, identify PCI parameters, test memory, and even display PnP resource allocations. If you are into serious board-level repair of PCs, you'd be badly missing out if you didn't have Craig's diagnostic tools to hand. To top it all off, Craig is offering them as freeware, along with the source code — a commendable approach, and one that will help many technicians in the field.

Also on offer are a list of PC hardware links, some meaty info on PnP, and a sensible article on the Y2K problem, all from someone who obviously knows the PC's architecture inside out. ❖

EA Directory of Suppliers

Which of our many advertisers are most likely to be able to sell you that special component, instrument, kit or tool? It's not always easy to decide, because they can't advertise all of their product lines each month. Also, some are wholesalers and don't sell to the public. The table below is published as a special service to EA readers, as a guide to the main products sold by our retail advertisers. For address information see the advertisements in this or other recent issues.

Supplier	State	A	B	C	D	E	F	G
Altronics	WA	•	•	•	•	•	•	•
Dick Smith Electronics	ALL	•	•	•	•	•	•	•
Emona Instruments	NSW						•	
Jaycar Electronics	Eastern	•	•	•	•	•	•	•
Oatley Electronics	Eastern	•			•	•		
Obiat	NSW						•	
RCS Radio	NSW			•				
Scientific Devices	VIC						•	

KEY TO CODING

A	Kits and modules	D	Components
B	Tools	E	IC chips and semiconductors
C	PC boards and supplies	F	Test and measuring instruments
		G	Reference books

Note that the above list is based on our understanding of the products sold by the firms concerned. If there are any errors or omissions, please let us know.

Electronics Australia Reader Services

SUBSCRIPTIONS: All subscription enquiries should be directed to: Subscriptions Department, FPC Magazines, PO Box 199, Alexandria 1435; phone (02) 9353 9992.

BACK ISSUES: Available only until stocks are exhausted. Price A$7.50 which includes postage within Australia only. **OVERSEAS READERS SHOULD ADD A FURTHER A$2.50 FOR EVERY BACK ISSUE REQUIRED.**

PHOTOCOPIES: When back issues are exhausted, photocopies of articles can be supplied. Price $7.50 per project or $15 where a project spreads over several issues.

PCB PATTERNS: High contrast, actual size transparencies for PCBs and front panels are available. Price is $5 for boards up to 100sq.cm, $10 for larger boards. Please specify negatives or positives.

PROJECT QUERIES: Advice on projects is limited to postal correspondence only and to projects less than five years old. Price $7.50. Please note that we cannot undertake special research or advise on project modifications. **Members of our technical staff are not available to discuss technical problems by telephone.**

OTHER QUERIES: Technical queries outside the scope of 'Replies by Post', or submitted without fee, may be answered in the 'Information Centre' pages at the discretion of the Editor.

READER SERVICES BULLETIN BOARD: (02) 9353 0627; ANSI, 24 hour access; any rate to 28.8kb/s.

PAYMENT: Must be negotiable in Australia and payable to Electronics Australia. Send cheque, money order or credit card number (American Express, Bankcard, Mastercard or Visa card), name and address (see form).

ADDRESS: Send all correspondence to: Reader Services Co-Ordinator, Electronics Australia, P.O. Box 199, Alexandria NSW 1435; phone (02) 9353 0620. (E-mail to elt@hannan.com.au)

PLEASE NOTE THAT WE ARE UNABLE TO SUPPLY BACK ISSUES, PHOTOCOPIES OR PCB ARTWORK OVER THE COUNTER.

Name:.....

Address:.....

.....State:.....Postcode:.....

Back issues:.....

.....

.....

Photocopies:.....

.....

.....

Amount: A$.....

Signature:.....(Unsigned orders cannot be accepted.)

Method of Payment: (Please circle correct method.) Credit card / Cheque / Money order.

Credit cards accepted:

Mastercard, American Express, Visa Bankcard (please circle applicable card).

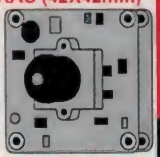
Expiry date:.....

....

ADVERTISING INDEX

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

COLOUR CCD CAMERAS (42X42mm)



2 lux.colour With built in audioAvailable with one of these lenses 3.6mm-92 deg./4.3mm -78 deg.5.5mm-60 deg Special introductory Price of just $189

B/W cameras see our other ad this issue

PARROT VOICE RECOGNITION DIARY

Access up to 350 names and their Ph./Fax No's just by the sound of your voice. Easy to use ,small pocket sized unit. Also up to 13 min of vocal memo notes, appointment book, clock, Ph assistant etc. Quality product made by IBM, retails for $300, we have limited quantity at: $130

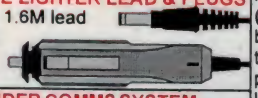
IR SWITCH KIT: Ref: EA March 96.

Uses a commercial coded IR Transmitter and a Receiver kit. The IR Tx has one button and is powered from 9V. Size 115 x 33 x 22mm. The Tx uses an UM3750 (combined code & decode chip). The Rx uses a receiving module to pick up the 40KHz IR signal. This demodulated code is simply detected & not decoded. The detected level switches a 4013 (wired as a toggle flip flop) then a relay via a transistor. Can be used as a high security remote. This uses the UM3750 IC in the Tx board as a decoder, while a second IR Tx is used. The relay is only on provided correct code is received. UM3750 has 12 coding inputs. Program your PIN in the Tx & Rx UM3750. Note: you need to purchase two IR Tx & one Rx kit to make this high security remote. * IR Switch Kit (with 1 transmitter):(K66S) $20 *Secure IR Switch Kit (with 2 transmitters): (K66C) $28

WIRED IR REPEATER KIT: Ref: EA March 96.

Simple kit which uses a commercial IR Transmitter and a Rx kit which works with most remote controls. The receiver uses a receiving module to pick up the 40KHz IR signal. The output of the receiver module is connected to the IR LED driving circuit of the IR Tx. This retransmits, giving an extension in range of up to 15 metres: (K66R) $20

CIGARETTE LIGHTER LEAD & PLUGS



Heavy duty 1.6M lead Removable 4A fuse $1.50

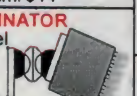
DRIVER/ RIDER COMMS SYSTEM

Ideal for rally driver/co-driver communations or bike intercom. This is a new (surplus) professionally made unit and requires some minor wiring & a cheap pair of head phones for this & many more applications. With 2 high quality unidirectional electret Noise Canceling Microphones with wind filters & mounting clips. Appears to have been designed for a comm unications system. (AP3)$18

NEW STEPPER MOTORS

30 oz./in. torque, 2.5 deg. 144 step, low voltage, compact 57 x 38mm: $14

POWERFUL 80 IR ILLUMINATOR



With strong universal swivel mount & 50X50X50mm housing:$36 Just $30 With any camera purchase

OATLEY ELECTRONICS

PO Box 89 Oatley NSW 2223
Ph (02) 9584 3563 Fax 9584 3561
orders by e-mail: oatley@world.net
www.oatleyelectronics.com
major cards with ph. & fax orders,
Post & Pack typically $6

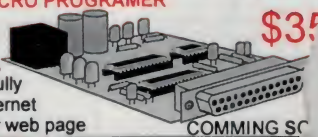
X-RAY MACHINES, HEART MONITORS, SATELLITE TV EQUIPMENT, OSCILLOSCPOES, OTHER TEST EQUIPMENT

These are some of the items that may still be for sale at our Web Site. See our BARGAIN CORNER, TRADERS CORNER & FREE ADS
FREE ADS should be E-mailed with "FREE ADS" in the subject window

KITS OF THE MONTH

VERY EFFICIENT WHITE LIGHT+ LCD DISPLAY: Brand new Sharp 640 x 480 LCD display (LM64P722) with a very efficient "state of the art" cold cathode Backlite Fluorescent lamp (5mm diameter, 150mm long) which is very easy to remove! Gives useful white light at only about 1-3W AC input! with 10 000 hour life! Removing the display will reveal a very uniformly lit backplane 150 x 200mm. Display plus Backlight + Inverter Kit (Needs 12V-150mA): (D11) $20 (Data sheets for a similar display: $2)

NOW TRY OUR PROFESSIONAL PIC MICRO PROGRAMER



Programs up to 39 different types of PIC chips, Software works under DOS, WIN 3.xx and WIN 95, Quick Easy construction, Connects to Pc's parallel port. Download fully functional evaluation software from the Internet register for a small fee. More details on our web page

$3[illegible]

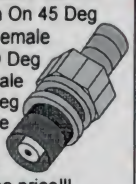
COMMING SO[illegible]

WE BUY NEW & USED SURPLUS OR STOCK COMPONENTS, MODULES, P[illegible]Ct MOTORS, GEAR BOXES, HOUSINGS, PLUGS, SWITCHES, MET[illegible]ERS, ASSEMBLIES. CALL OR FAX WITH DETAILS. LARGE OR SMALL QUANTI[illegible]IES

NEW DIGITAL BAR CODE WANDS:

USA made, with 2.5m curly cord & 5pin 240° DIN plug. With an Optical sensor, visible Red LED, a photo IC detector & precision aspheric optics. Converts bar codes to digital pulses.Uses a Sapphire tip, pot size 0.19mm. TTL /CMOS compatible open collector output. Req.5Vsupply: (G61) $40

BARGAIN PACK HIGH QUALITY 1.6 / 5.6 SERIES SIEMEMS CONNECTORS,

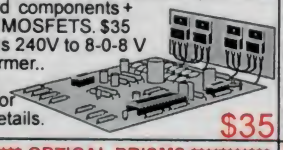


92 date code, See Siemens web site. Compatible with new series. Some gold platting. High Quality co-axial connectors.. **Just.$19 for 24.** You get.....
2x...43 - Panel or Line Push on Female
5x...106 - Straight Line Male Push On
2x...172 - Line Male Push On 45 Deg
7x...169 - Panel or Line Female
3x...171 - Line Female 90 Deg
2x...173 - Straight Line Male
2x...105 - Line Male 90 Deg
1x...30 - 90 Deg Line Male
An international supplier Lists simmilar connectors for more than 10 times The price!!!

NEW 1/2/3 AXIS CNC SYSTEM.

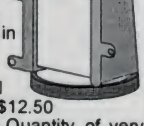
(computer numerical control) This system includes a new stepper motor driver kit (one kit required for each axis) designed to be used with software freely available on the Internet for use with home or professionally built a milling machine, lathe, engraver or cutter etc. with home & limit switches and a high degree of accuracy (can be better than .001". We supply the kit inc. Pcb all on-board components etc. plus Internet resources shareware software & building or buying mechanical components. Around $40 per axis. Call for further details.

12VDC - 240AC INVERTER



Features include modified square wave output, Auto start with load sensing, Uses six power MOS-FETS with minimal heatsinking required. 200 - 600VA. Dependant on trans former size. To save money you can use an rewind your own transformer. Basic kit includes pcb & all on-board components + 4 X 60A MOSFETS. $35 Requires 240V to 8-0-8 V Transformer.. Ring or E-Mail for More Details. $35

********** OPTICAL PRISMS **********



These are military spec. optically pure glass prisms set in a diecast mount (removable).They are in A1 condition and stored in plastic (no scratches) They will show colours of the spectrum on a wall when placed in sunlight $12.50 We also have a small Quantity of very large prisms "RING FOR DETAILS"

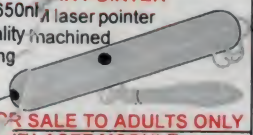
COMPUTER CONTROLLED STE[illegible] MOTOR DRIVER KIT

can drive larger motors, Has optoIsolation. Inc. Software & notes: $40 Or $50 with two Used 23 frame 200 step 1.8 Deg. m[illegible]tors!!

NEW DESIGN 110W CF[illegible] INVERTER

This kit is a redesign of [illegible]our extremely popular inverter kit. Th[illegible] new design uses a larger[illegible] trans-former and a SG352[illegible]5 switch Mode Chip. This very Efficient Driver kit can drive up to 11 X 10w C[illegible]FL's from 12v And would be gre[illegible]t for lighting the weekender or caravan. Kit inc. 1 inverter & 1 CFL: $30

KEY-CHAIN LASER POINTER

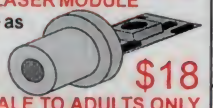


Very bright 650nM laser pointer in a high quality machined metal housing

$20

FOR SALE TO ADULTS ONLY

VERY BRI[illegible]T LASER MODULE

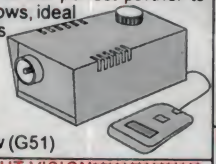


650 laser m[illegible]dule as used in t[illegible] above poin[illegible]er. (Lm2)

$18

FOR SALE TO ADULTS ONLY

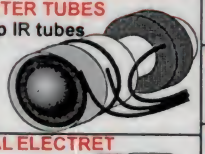
PROFESSIONAL FOG MACHINES



This unit would be the perfect partner to our laser light shows, ideal for discos, parties fashion parades etc. A special intro. price of under $200 Coming soon Reserve one now (G51)

**********NIGHT VISION**********

IMAGE CONVERTER TUBES



Hard to find deep IR tubes As used in night viewers. Tube plus EHT power supply kit plus suitable

UNIDIRECTIONAL ELECTRET MICROPHONE

New quality product with clip, 3M lead, 2.5mm plug: $4 Make a stage quality wireless microphone by combining it with our FMTX MK2 transmitter kit: $16 for the kit plus the microphone

Series I, 3/4 CHANNEL UHF RECEIVER:

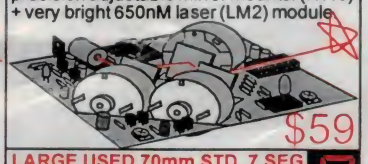
Ref: EA Mar 94. Control up to 4 output relays. Uses a pre-built and pre-aligned UHF (304MHz) receiver module & security coding ICs. Output relays have 5A contact ratings and can be configured for toggling operation at each press of a Tx button or momentary operation when Tx button is pressed. 1 X 3ch transmitter plus 1 X4ch receiver:$50 extra Tx $15 is req. to access the fourth relay. 12V operation. (K39) $70

LEDs, TRANS[illegible] FLASHING LEDs & PHOTO [illegible]SISTORS

(NOTE: When buying LEDs [illegible]hat most STANDARD LEDs are 3mm [illegible]mC or less!!)
mC - [illegible]3000 mC - YELLOW: 10 for $5. 300 10[illegible] GREEN: 10 for $3. 1400 mC - RED 5[illegible] for $6. Photo Transistor: 10 for $5
m[illegible]nm 3000 mC - YELLOW: 10 for $6. 300 [illegible]C - GREEN: 10 for $4. 3500 mC - RED: [illegible]0 for $6 Photo Transistor: 10 for $5
5mm FLASHING 3000 mC - YELLOW: 10 for $10. 60 mC - GREEN: 10 for $10. 300 mC - RED 10 for $10
10mm 3000 mC - RED: 10 for $12
10mm FLASHING 400 mC - GREEN: 10 for $12. 3000 mC - YELLOW: 10 for $12
5mm IR 850nM 10 x brighter than 880nM [illegible]mit some visible red $1.30 Ea. 10 for $10
[illegible]YSTERY BAG 100LEDs Contains: [illegible] standard LEDs!!! [illegible]premium quality. or better with at least [illegible]ue (if not more), 1 ultra green and 1 [illegible]shing. An absolute steel at $8 per bag.

NEW SUPER LOW PRICE + LASER AUTOMATIC LASER LIGHT SHOW KIT: MKIII.

Automatically changes every 5 - 60 secs, & is adjustable. Each motor has 8 speeds, one motor is reversible, & one can stop. Countless great displays from single to multiple flowers, collapsing circles, rotating single and multiple ellipses, stars, etc. Easy mirror alignment with "Allen Key". Kit inc. PCB, all on board components, three small DC motors, mirrors, precision adjustable mirror mounts: (K115) + very bright 650nM laser (LM2) module

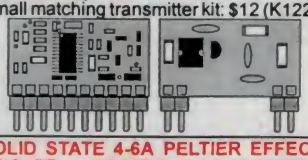


$59

LARGE USED 70mm STD. 7 SEG.

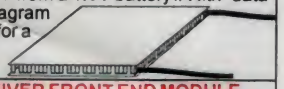
(no data avail.) 7 FOR $20 (DI2) Ideal for illuminated house number

UHF DATA TRANSMISSION



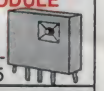
Stamp sized Xtal locked 433.9MHz superhetrodyne receiver module $25 Small matching transmitter kit: $12 (K122)

SOLID STATE 4-6A PELTIER EFFECT COOLER / HEATER



3.3A@14V(GP1) PELTIER: $27, 6A@15V(GP2) Peltier: $35, both approx. 40X40X4mm, temp. Control via supply voltage /current, will even work from a 1.5V battery!! With data sheet, diagram & circuit for a Fridge / Heater.

IR RECEIVER FRONT END MODULE



Contains an IR receiver diode, amp tuned to 38KHz, a band-pass filter, an AGC section & de-tector circuit. $2 Ea or 10 for $15

BRAND NEW STD LCD

1 line x 16 . : $16 (D03) 2 line x 16 . (DI4) with LED back-light:$24

**** 240V 6" FANS ****

Good but limited qty. These fans are re-covered items but are almost new & in excellent condition. Just $6 Ea. or 3 for $12

*** NEW *** NEW *** NEW *** HIGH POWER IR FENCE / DRIVEWAY / DOOR MINDER

Applications include powerful Passive infrared de-tector, IR invisible fence / gate & doorway monitor. Range: with 5 IR LEDs (can drive up to 50 IR LEDs) passive mode 10m (5 LEDs), active mode 40m (5 LEDs). Range can be boosted with a cheap torch re-flector. The kit has on board relay + active high & active low outputs for relays etc Simple to construct PCB can be cut into two for active mode Kit inc. PCB, all on-board components, 5 IR LEDs + salvaged new plastic case All for $18 Extra box (for active mode) + swivel mount $3

Reader Info No 40

Where do you GO for the last word in electronics?

Exclusive to our dynamic PowerHouse stores in Bankstown, Penrith and Carnegie

DISCOVER THE POWERHOUSE DIFFERENCE.... AND TRY BEFORE YOU BUY

DICK SMITH ELECTRONICS POWER HOUSE

BIG BRANDS GUARANTEED BIG VALUES

As soon as you step inside either of our brand new Dick Smith Electronics PowerHouse stores you will discover a whole new world of hands-on shopping like never before. There's rows and rows of products and power-packed deals for you to choose from with a selection of over 20,000 items.

With big brands and big values guaranteed, we know you'll like what you see!

We have an Internet Bar where you can surf the Net, the latest digital imaging technology, showcasing scanners, printers and digital cameras, over 12,000 music and movie titles, home entertainment, electronics equipment, phones, mobiles, Home Theatre systems, TVs, VCRs, computers, software and so much more

The PowerHouse hands-on experience allows you to touch, listen and connect with the latest technology – you can expect friendly, expert advice from our knowledgeable staff and shopping the whole family can enjoy.

8-zone security alarm panel

Total home security with this full functional alarm panel.

Features

- 8 fully programmable zones • Supports up to 5 remote LED keypads • 15 user codes and 2-button arming feature • Includes programmable siren/reset lockout, panic button and auto test calls
- Power supply is 13.8V DC at 800mA • Supplied with 12V 7Ah sealed lead acid rechargeable battery.

L 7300

NEW NESS **$399**

D-8 Remote keypad

To suit D-8 alarm panel.

L 7305

$119

NESS

NEW

Internal ceiling horn speaker

8 ohm, 10 watt horn speaker.

L 7310

$19.95

NESS

NEW

DICK SMITH ELECTRONICS POWER HOUSE

eftpos Participating Cards Welcome Here — All major credit cards accepted

...where the experience is part of the fun!

1048 - 1054 Dandenong Rd
CARNEGIE Ph: 9569 2644

On the corner of Mulgoa Rd and Batt St
PENRITH PH: 4721 1544

The Christies Centre
On the corner of Chapel and Canterbury Rds **BANKSTOWN**
Ph: 9793 9677

DICK SMITH ELECTRONICS

That's where you go!

B 3618